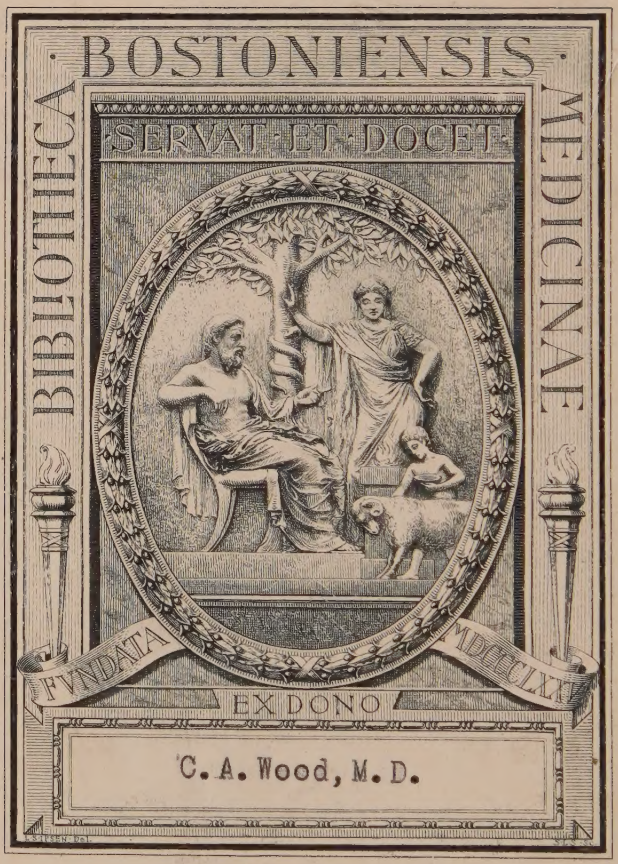
COUNTWAY LIBRARY
HC 51RW 8

28. N. 81.


BIBLIOTHECA · BOSTONIENSIS · MEDICINAE
SERVAT · ET · DOCET
FVNDATA
MDCCCLXX
EX DONO
C. A. Wood, M. D.

A SYMPOSIUM ON

THE EXTRACTION OF SENILE CATARACT

Being a complete report of the papers and discussions presented before the Chicago Ophthalmological Society, November 20, 1911.

EDITED BY

HARRY W. WOODRUFF, M. D.

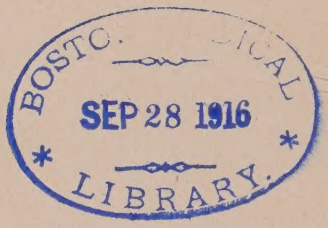
President of the Chicago Ophthalmological Society; Professor of Ophthalmology in the Chicago Eye, Ear, Nose and Throat College; Surgeon to the Illinois Charitable Eye and Ear Infirmary.

Illustrated

CHICAGO:

CLEVELAND PRESS

1912



13972 Dr. Wood.

Copyright 1912
By The
Cleveland Press
Chicago

INTRODUCTION.

The contents of this book represent a Symposium on the Extraction of Senile Cataract which formed the program of the meeting of the Chicago Ophthalmological Society, Nov. 20, 1911.

The president was instructed by the society to appoint a committee to arrange for the publication of the papers and discussions. This committee was composed of three members, Drs. W. A. Fisher, Casey Wood, and Chas. H. Beard. The editor acknowledges his indebtedness to these members, and also to Dr. J. Herbert Claiborne, who edited a similar volume in 1908 which represented the work of the Ophthalmological Section of the New York Academy of Medicine.

While there are many steps in the operation under discussion upon which there may never be an absolute unanimity of opinion, much can be learned from the methods of different operators. The operation of intracapsular extraction may never be universally adopted in this country. It has, however, done much to awaken thought and shows the possibility of improvement in an almost perfected operation. It has, as the contents of this book will show, brought out in almost every paper some reference to a change of more or less importance in technic.

The editor has taken the liberty of commenting upon the different papers either by making additions of his own or by quotations from well known authors.

Joliet, Ill. H. W. W.

CONTENTS.

CHAPTER I.

THE PREPARATION.....Thomas Faith, M. D.
Discussion.....Wm. E. Gamble, M. D.

CHAPTER II.

THE INCISION.....Wm. H. Wilder, M. D.
Discussion.....Oscar Dodd, M. D.

CHAPTER III.

THE IRIDECTOMY.....Casey Wood, M. D.
Discussion.....Willis O. Nance, M. D.

CHAPTER IV.

THE CAPSULOTOMY.....W. A. Fisher, M. D.
Discussion.....Harry S. Gradle, M. D.

CHAPTER V.

THE DELIVERY OF THE LENS.....Derrick T. Vail, M. D.
Discussion.....Richard J. Tivnen, M. D.

CHAPTER VI.

THE TOILET.....Chas. H. Beard. M. D.
Discussion.....E. J. Gardiner, M. D.

CHAPTER VII.

COMPLICATIONS AND AFTER-TREATMENT...D. W. Greene, M. D.
Discussion.....Cassius D. Wescott, M. D.

CHAPTER VIII.

GENERAL DISCUSSION.....Oliver Tydings, M. D.
.....W. Franklin Coleman, M. D.
.....Geo. F. Suker, M. D.
.....Heman H. Brown, M. D.
.....Henry B. Young, M. D.

COLLABORATORS.

THOS FAITH, M. D., CHICAGO.

Professor of Ophthalmology in the Chicago Eye, Ear, Nose and Throat College. Oculist and Aurist to St. Anthony's Hospital.

WM. E. GAMBLE, B. S., M. D., CHICAGO.

Professor Clinical Ophthalmology and Associate Professor of Ophthalmology, College of Physicians and Surgeons, Medical Department, University of Illinois.

WM. H. WILDER, A. M., M. D., CHICAGO.

Professor and Head of Department of Ophthalmology, Rush Medical College (in affiliation with University of Chicago); Professor of Ophthalmology, Chicago Polyclinic; Surgeon Illinois Charitable Eye and Ear Infirmary; Ophthalmic Surgeon, Presbyterian Hospital.

CASEY A. WOOD, M. D., CHICAGO.

Ex-President of the American Academy of Medicine, of the American Academy of Ophthalmology and of the Chicago Ophthalmological Society. Consulting Ophthalmic Surgeon Cook County Hospital, Attending Ophthalmic Surgeon to St. Luke's Hospital, etc.

OSCAR DODD, M. D., CHICAGO.

Surgeon Illinois Charitable Eye and Ear Infirmary. Oculist to Augustana Hospital.

WILLIS O. NANCE, M. D., CHICAGO.

Surgeon Illinois Charitable Eye and Ear Infirmary; late Oculist and Aurist to Cook County Hospital; Secretary Chicago Ophthalmological Society.

WM. A. FISHER, M. D., CHICAGO.

President of and Professor of Ophthalmology Chicago Eye, Ear, Nose and Throat College; Professor of Clinical Ophthalmology College of Physicians and Surgeons, Medical Department of the University of Illinois; Ex-President, Chicago Ophthalmological Society.

HARRY S. GRADLE, A. B., M. D., CHICAGO.

Professor of Ophthalmology at the Chicago Eye, Ear, Nose and Throat College.

DERRICK T. VAIL, M. D., CINCINNATI, O.

Ophthalmologist to the Cincinnati Municipal Hospital; Clinical Professor Ophthalmology to the Ohio-Miami Medical College, University of Cincinnati, etc.

RICHARD J. TIVNEN, M. D., CHICAGO.

Oculist and Aurist, Mercy Hospital; Assistant Surgeon Illinois Charitable Eye and Ear Infirmary; Instructor in Ophthalmology and Otology, Northwestern University Medical School; Consulting Oculist and Aurist to Mary Thompson Hospital; Member of Consulting Staff of the Cook County Hospital.

CHAS. H. BEARD, M. D., CHICAGO.

Surgeon to the Illinois Charitable Eye and Ear Infirmary; Oculist to the Passavant Memorial Hospital; Ex-President of the Chicago Ophthalmological Society.

EDWIN J. GARDINER, M. D., CHICAGO.

Professor Ophthalmology, Chicago Eye, Ear, Nose and Throat College.

DUFF W. GREENE, M. A., M. D., DAYTON, O.

Oculist and Aurist to St. Elizabeth Hospital; Oculist and Aurist to the National Military Homes; Oculist and Aurist to the Ohio Soldiers' and Sailors' Orphans' Home, etc.

W. Franklin Coleman, M. D., M. R. C. S. Eng., Chicago.

President of and Professor of Ophthalmology in the Post-Graduate Medical School of Chicago; Professor of Ophthalmology in the Illinois School of Electro-Therapeutics; Ex-President of the Chicago Ophthalmological Society.

Heman H. Brown, M. D., Chicago.

Professor of Ophthalmology, Chicago Eye, Ear, Nose and Throat College; Ophthalmologist to Columbus Hospital.

Cassius D. Wescott, M. D., Chicago.

Attending Ophthalmologist St. Luke's Hospital; Consulting Ophthalmologist St. Anthony Hospital.

Henry B. Young, A. M., M. D., Burlington, Ia.

Member of the Faculty Burlington Hospital and Mercy Hospital Training Schools for Nurses; Oculist E. I. Division C., B. & Q. R. R.

Oliver Tydings, M. D., Chicago.

Professor of Ophthalmology, Otology, Rhinology and Laryngology, Chicago Eye, Ear, Nose and Throat College.

George Francis Suker, M. D., Chicago.

Professor of Ophthalmology, Post-Graduate Medical School; Consulting Ophthalmologist, Mary Thompson Hospital; Attending Ophthalmologist, Chicago Refuge for Girls; President of American Academy of Ophthalmology and Oto-Laryngology; Secretary Chicago Medical Society.

LIST OF ILLUSTRATIONS.

Fig. 1.—Some of the iridectomies and iridotomies made in various combined methods..... 47
Fig. 2.—Verhoeff's modified iridectomy..... 48
Fig. 3.—Capsulotomy. Cystotome in position..... 58
Fig. 4.—Capsule forceps in position..... 59
Fig. 5.—Tooke capsule forceps in position..... 59
Fig. 6.—Fisher's capsule forceps..... 60
Fig. 7.—Fisher's capsule forceps in position..... 61
Fig. 8.—Fisher's light..... 62
Fig. 9.—Fisher's lid retractor..... 63
Fig. 10.—Expulsion of the lens; first step in Smith method.. 64
Fig. 11.—Fisher's capsule forceps in position; patient looking at ceiling..... 65
Fig. 12.—Fisher's lid retractor in position..... 66
Fig. 13.—Showing the correct pose for the assistant in exposing the eyeball for delivery of the lens..... 70
Fig. 14.—Showing the lens-nucleus escaping through wound as a result of proper pressure with elbow of lens-hook 71
Fig. 15.—Side view of above..... 72
Fig. 16.—Showing convenience of removing lens from wound after delivery by using same lens-hook that effected delivery..... 73
Fig. 17.—Showing Knapp's method of ridding the pupil space of soft cortex after nucleus has been delivered..... 82
Fig. 18.—Side view illustrating how the nucleus may be successfully delivered in unruly patients..... 83
Fig. 19.—Showing where the bulbous tip of the lens-hook is applied in the first effort at delivery in the capsule.. 84
Fig. 20.—Illustrating deep pressure being applied below the lens and toward the depth of the eye to cause upright delivery..... 86
Fig. 21.—Steps in the delivery of the lens..... 87
Fig. 22.—Steps in the delivery of the lens..... 88
Fig. 23.—Showing combined pressure in case the lens does not glide upwards out of wound..... 91
Fig. 24.—Illustrating the lens-spoon introduced a short distance behind the lens to afford a background for pressure to relieve a threatening vitreous..... 92
Fig. 25.—Illustrating how by increasing tension of the vitreous with the added pressure of the spoon below the cornea a "stubborn" lens may be started from its bed and a successful and "dry" delivery effected 93

BOSTON MEDICAL
SEP 28 1916
LIBRARY.

CHAPTER I.

THE PREPARATION.

By Thomas Faith, M. D., Chicago.

The preparation for the operation of cataract extraction may be separated into four divisions, viz., the general preparation of the patient; the preparation of the field of operation; the preparation of the operator and assistants; and the preparation of the instruments. While all four divisions of the subject are of the utmost importance, the first, the general preparation of the patient, is the one most commonly neglected, and I am firmly convinced that it is often the most important contributing factor in the success or failure of the operation.

In the general preparation we must include a wide range of examinations in order to have our subject properly fortified for the ordeal which he or she is to undergo, and for this reason the patient had best be under close observation for some time beforehand, or, better still, should be in the hospital for a number of days preceding the operation so that the various examinations may be made and repeated, if necessary, and the patient kept under more or less constant observation.

These general examinations should include the excretions; kidneys and bowels; the digestive tract; the lungs; throat, nose and ears; the cardio-vascular system and blood. Also the nervous system; a close inquiry as to habits; the use of drugs, alcohol, snuff, etc.; and the presence or history of lues.

The urinalysis should be complete, both microscopic and chemical, including quantitative estimation of urea and indican, and of any pathological contents that may be present.

The presence of a large amount of indican, of sugar in considerable quantity, or of albumen, while they may not prohibit the operation, should be an indication for such treatment as will reduce, if not cause their disappearance, before proceeding to operate. If a large amount of indoxyl potassium sulphate

(indican) is present it should, if possible, be reduced by elimination and proper diet, and it should be borne in mind that its presence in quantity indicates a condition of either putrefaction in the small intestine or some organic destructive disease.

The presence of sugar need not be a contra-indication for operation, but it should first be reduced to the lowest amount possible; then, too, the absence of, or diminution of, the acetone bodies from the urine of such patients is important and should be sought by every means. In this connection it is well to remember that a nervous shock may cause the sudden output of sugar to be markedly increased; as a result of a decrease in the oxidative powers of the body, there is accordingly a great increase in the oxybutyric acid output, and as there is always a retention in proportion to the amount eliminated coma may ensue as the direct effect of the operation if it proves to be a nervous shock to the patient. We are all also familiar with the delayed healing, low-grade inflammatory and nutritive changes, which may follow a wound in a diabetic and we should therefore see that these patients are in the very best condition possible before operating them.

The presence of small amounts of albumen or a few casts is not necessarily of serious importance unless the patient also has a high blood pressure, but should put us on our guard for further post-operative developments. A urine of low specific gravity which may or may not be deficient in quantity should always put us on the lookout and cause us to estimate the amount of urea eliminated for we all know such cases do badly when put in bed, and under such conditions unless we are able to correct the deficiency we should not confine the patient to bed any more or any longer than is absolutely necessary. Oliguria, however, may only be the result of psychic depression and may therefore be of no importance.

A knowledge of the degree of acidity or alkalinity of the urine is important, as it might lead us to investigate further, as to the presence of attacks or renal colic, vesical irritability and cystitis, the existence of prostatic enlargement, stricture, etc., all of which should be known in order that we may be upon our guard for post-operative troubles and thus possibly prevent them.

The condition of the patient's bowels should be ascertained, and if constipation exists they should be thoroughly emptied and

an attempt made to regulate them for a few weeks before operating. If the bowels are regular a single brisk cathartic should be given a day or two before the operation. If diarrhea is present a calomel purge and castor oil will usually correct the trouble unless of a chronic type when the cause must be ascertained, and, if possible, removed before attempting operation; for some of these old people absolutely will not use a bed-pan, but will get up and go to the toilet at the first opportunity in spite of warnings and a nurse.

The stomach and abdomen should be examined or at least a complete history should be taken in order that we may know the behavior of the digestive organs under various conditions and after certain foods are taken, e. g., many old people cannot take milk on account of stomach distress and, as they term it, billousness; others are attacked with indigestion when eggs are taken; and still others (and there are many of these) are absolutely unable to digest meats. As these patients are usually old they frequently have formed ideas as to their diet, etc., which, although they may appear unreasonable to us, are rational enough to them, and we should not disregard what seems to us to be their whims, as experience often proves to us that they are not altogether fancies.

The condition of the respiratory organs should always receive attention. The lungs should be examined and the patient questioned as to the history of bronchitis and asthma in particular, and if either of these conditions are present they should be treated before proceeding to cataract operation. If a cough exists its cause should be determined and, if possible, removed; and the influence of posture upon the patient's respiratory apparatus should be inquired into. If the respiratory condition is one which cannot be cured in a reasonable time, cough sedatives and drugs which will relax bronchial spasm may be used temporarily until the danger time has passed. I have only recently seen a case in which an apparently skillfully performed operation came to naught on account of haste on the part of the operator who did not wait long enough to get the patient's cough under control; the wound was reopened during a paroxysm of coughing and the eye lost.

The nose should be examined particularly for the presence of ozena and sinus suppuration, and the patient should be ques-

tioned as to the existence of hay fever, rose cold, periodic attacks of sneezing, etc.

The mouth and throat should be examined so that we may be aware of any septic condition in particular, such as pyorrhea and post-nasal catarrh, or any irritative condition of the pharynx or tonsils, elongation or edema of the uvula. Then, too, evidence of the existence of lues is frequently found in the mouth and throat and we should be constantly on the lookout for that condition. The patient should be questioned and the ears examined for purulent discharge, which condition might be a direct cause of infection, but which could easily be prevented if known beforehand.

Of course, many of the conditions of the nose, throat, etc., which I have mentioned cannot be cured before operating; but if we take them into account beforehand we may use such local measures as will minimize the danger from these sources. If, for example, there is ozena, sinus suppuration or polypi, the proper treatment of the nose for a time will lessen the danger of infection from this source, even though a cure may not be effected; and the use of proper antiseptic solutions in the mouth, nose and throat will undoubtedly diminish the danger of infection from that source; while a suppurating ear can usually be held practically inactive as long as it is kept clean and dry.

The presence of an acute coryza should be an absolute contraindication for operating; so too an attack of hay fever, for which we should put off operating until the hay fever season has passed.

The cardio-vascular system requires particular attention and careful investigation in all cases of senile cataract. An examination of arterial tension, should always be made, whether suggestive general symptoms are present or not; and where the tension is high, efforts to correct the condition should be made by promoting elimination, arranging the diet, and by the use of the nitrites. This should be carried on for some time, in fact, until the tension is reasonably reduced in order to guard against a possible choroidal or retinal hemorrhage. Of this condition there is much to be said of the various lines of treatment, the administration of salicylates, the acetates, bicarbonate and iodide of potassium, the various mineral waters and the judicious use of digitalis, and many other remedies.

In this connection it is well to remember that there are three

types of arterio-sclerosis; to quote Osler, they are: "First, the involuntary in which the degeneration is caused by the ordinary wear and tear of life, and which is as natural as gray hair and failing eye sight; second, the toxic group, which is caused directly by the poisons of acute and chronic infections and the intoxications; and thirdly, the hyperpietic group, in which the degenerations follow persistent high arterial tension." As Osler puts it: "The result of supplying the fuel for fifty miles an hour, and running the engine at ten miles, the subjects of this condition eat and drink too freely and do not take enough exercise; while what work they do is usually mental and is done at high tension." These facts should be taken into account in the management and treatment of our cases.

The blood need not always be examined, yet if any general condition exists which is not explained by urinalysis, examination of the heart, arteries, or digestive tract, or if the patient appears run down, poorly-nourished or anemic, a blood examination should be made for, as Cabot puts it: "It is well to remember that even a patient with red lips and a normally pink conjunctiva is often found to have some form of anemia." It is also quite apparent that an abnormal blood condition may predispose to intra-ocular hemorrhage quite as well as a diseased condition of the vessel walls; and such cases may need iron, arsenic or calcium salts as well as increased elimination, proper diet, including plenty of milk, eggs, etc.

"It occasionally happens that these old people do not eat nutritious foods because they are unable to take care of them. Either from poor teeth or weak digestion, they refuse all proteids; this may necessitate the use of an artificial digestant for a time, or of artificially prepared peptones, which is one of the best stimulants to digestive secretion, being at the same time of great nutritive value. These patients may also take meats in judicious quantity even if the teeth are bad, provided it is ground up for them, and provided also that they are given an artificial digestant or gastric stimulant, until the blood count shows an improved or even normal condition.

A complete examination of the nervous system is rarely necessary though a full history in this connection is important, and, of course, the patient's reflexes and co-ordination should be tested and we should take account of any evidence of organic

nervous disease which may be present. We should inquire as to the history of gastric crises, or gastric neuroses, also in particular as to the history of epilepsy, fainting spells, attacks of melancholia, migraine, etc.; and while none of the conditions mentioned might be considered as contra-indications in a strict sense, they might be the cause of modifying our procedures, or of putting us on our guard as to the patient's preparation and our management of the case after operation.

I have personally had two experiences with nervous cases which caused me considerable anxiety, and which have kept me on the lookout since. One, a case in which a history of epilepsy was not obtained before operation, and in which the corneal wound was broken open during an epileptic seizure. Had I known the facts beforehand the untoward result could in all probability have been prevented.

The other case was one of gastric neuroses in which the apprehension of the operation made the patient so nervous, that she was seized with a fit of gastric pain and vomiting as soon as I began the operation. I was therefore only able to do the iridectomy at the first operation and when, a few weeks later, I attempted the extraction, the experience was repeated. I then postponed the operation for a few days, gave some full doses of oxalate of cerium, which, acting directly upon the vomiting center, quieted the patient and I was enabled to proceed.

These experiences have made me cautious about obtaining a clear history as to such conditions and I find it is often a better plan to obtain this part of the history from another member of the family than to depend upon the patient's statements.

We should always inquire closely and examine these patients for lues, and while its presence is not always a contra-indication, any positive syphilitic lesion should cause us to put the patient upon full doses of mercury and iodides (or perhaps salvarsan) before going ahead.

It is very important to always inquire into the patient's habits with regard to the use of alcohol, drugs, tobacco and snuff; for it is a well-known fact that alcoholics who are suddenly and completely deprived of their accustomed stimulant are liable to develop delirium tremens, and for this reason it is probably better to give them a small quantity of wine, brandy, or whisky each day at regular intervals, just before and after operating, unless we

can deprive them gradually and completely for some time beforehand. Morphine and cocaine users will either have to be appeased with their favorite drug, or will have to be given a substitute if they are to be kept quiet long enough for healing to take place; if a cure of the drug habit is to be attempted it should be accomplished beforehand.

The use of snuff should be absolutely prohibited immediately before, and for a number of days subsequent to, operating.

As the obstetrician watches and directs his patients for months or weeks beforehand, preparing them for the delivery that all may be well at the critical time, so too should the ophthalmologist manage direct and prepare his cataract patients for to them an equally important delivery, and above all things he should not hurry matters, but take sufficient time to get his patient into the best possible condition, both mental and physical, before operating.

For some time before the day of operating arrives the skin of the lids, the lid margins, the conjunctiva and the lachrymal drainage apparatus, should be subjected to a rigid examination, searching for abnormal secretion and evidences of inflammation, crusting, scaling, etc. If the conjunctiva is congested or there is any undue secretion present, or if there is any marginal lid trouble, a microscopic examination should be made. In fact, a microscopic examination of smears from the conjunctiva should always be made, and if any pathogenic germs are found by either smears or cultures the eye should be treated until they have disappeared.

If the lid margins are inflamed they should be treated with five or ten per cent solutions of nitrate of silver until healed and spastic entropion should receive our attention if present.

If dacryocystitis is present there is only one certain way of preventing infection, and that is by preliminary removal of the tear sac, as ligation of the canaliculus and sealing of the puncta with the cautery are not always a success.

Lachrymal obstruction without sac inflammation and secretion may be treated by previous probing or, better still, by lachrymal styles, which should be removed several days or weeks before operating.

Iritis is a contra-indication of course, but if a chronic iritis is

present, iridectomy may be done and extraction subsequently if the iritis abates.

The eye should be examined for abnormal tension in every instance, and if there is the slightest doubt, if the anterior chamber is shallow, the pupil sluggish or the anterior scleral vessels are engorged the tonometer should be used, and if tension is above normal it should be reduced by either eserine, citrate of soda injections or a preliminary iridectomy. Here we should remember that a swollen lens is frequently the cause of temporary increase of tension, and there is no better method than preliminary iridectomy for dealing with such cases.

The eye should not be bandaged prior to operation, but may be flushed several times daily, for a number of days, with normal salt, or boric acid solution, or twenty-five per cent argyrol solution may be frequently instilled.

The day before operating the patient should have a bath and the head should be washed.

Immediately before the operation the brows, face and eyelids should be thoroughly scrubbed with some non-irritating soap and water. The brow may or may not be shaved, but the lashes for at least one-half or three-fourths of an inch from the external canthus should be clipped close so as to avoid contact with the knife. The conjunctival sac should now be flushed with sterile normal salt or boric solution, or 1 to 5,000 bichloride of mercury solution, using the Smith method, holding the lids away from the globe with speculum or retractors and thoroughly stretching out the folds of the cul-de-sac. Plenty of warmed solution should always be used with either an irrigator or a large bulbed dropper. The lid margins and lashes should be wiped thoroughly with sterile gauze sponges moistened with 1 to 5,000 bichloride solution, and the eye should be covered with a moist bichloride pad. The cocaine instillation may now be begun and three applications of a 4 per cent solution at four minute intervals is usually sufficient.

The field of operation is next surrounded with a sterile or bichloride-moistened operating cloth and the patient's head is enveloped in a sterile towel.

The operator should use the most rigid aseptic precautions in the preparation of his hands and those of his assistants. The assistants may wear rubber gloves, but it is doubtful if it would

be safe for the operator to do the same. In fact, I have never heard of an operator attempting it as the sense of touch is very important in this operation, and it is necessary to be very certain of the grasp of the instruments and the amount of resistance offered to them. The operator and assistants should wear sterile caps and sterile gauze coverings for the nose and mouth.

The Preparation of the Instruments.

The non-cutting instruments should be scrubbed well with brush and soap and thoroughly wiped to free them of rust, blood, etc. They should then be either wrapped in a sterile towel or put in a rack and boiled in a covered boiler for fifteen or twenty minutes, using a weak solution of sodium bicarbonate say 1 to 500 or 1 to 250; after boiling they should be again carefully dried with sterile gauze, placed upon a tray or instrument table and covered with dry sterile towels.

The cutting instruments should be either boiled for ten minutes or should be first carefully washed with sterile water and wiped with moist cotton sponges; then they should be immersed in either pure lysol, strong formalin solution 1 to 100, or, better still, in ninety-five per cent phenol for ten or fifteen minutes; after which they are well rinsed in alcohol and then in sterile distilled water. They should be again wiped dry with sterile sponges and are then ready for use.

There is still considerable difference of opinion as to the effects of these various procedures upon the edges of the knives, and they are probably all variously favored by different operators.

Discussion by Wm. E. Gamble.

To me a most illuminating part of tonight's program is Doctor Faith's paper. I can recall complications in cataract extraction I have had which might have been avoided if I had studied the patients more carefully.

It is well that the ophthalmic surgeon thinks of the eye upon which he is about to operate in terms of surgical cleanliness and surgical technique. Too frequently our attention to the patient himself consists in giving him a cathartic the night before the operation, with an enema the following morning, and examination of the urine for sugar and albumen, immediately before the operation in a seance of two or three minutes' duration, we

attempt to get the co-operation of the patient by having him follow our fingers in looking up, down and sidewise. We have not done our full duty to our patient until we have studied him as carefully as an internist would do.

Commonly, the general disorders that complicate cataract extraction are ones of metabolism, i. e., diabetes, gout, etc. I have under observation a man operated upon for cataract last summer by one of our confreres, the result being complete occlusion of the pupillary space due to inflammatory exudate. The operator was not aware that the man had been a sufferer from diabetes for several years before, the patient being very careful not to tell him anything about it.

The more or less recognized rule of ophthalmic surgeons, that you can operate cataract successfully in a diabetic patient when the sugar is below one per cent is not by any means infallible. The fact is that one must take into consideration the condition of his patient more than the amount of sugar in the urine.

The only instance of suppuration following extraction of cataract that I have had, was in a case of diabetes in an old man in which at the time of the operation there was less than one per cent of sugar. The patient died in less than two months after the extraction. He was operated at his own request with the understanding that there was not much hopes of obtaining vision.

I am of the opinion that in some of the cases operated upon in which the cortex seems to set up a mild grade of iritis, this complication could be avoided by previously to the operation administering iodide of potassium and other remedies to further elimination, or counteract the gouty tendency.

It goes without saying that the Wasserman test should be made frequently, where there is any clinical symptom or other evidence of past syphilitic infection; and especially questions asked leading to the discovery of evidence of hyalitis having been present.

The use of mercurial ointment or potassium iodide, while it may not influence the healing process, yet might prevent complicating low grade diseases of the uveal tract.

The state of mind of the patient is a factor not to be despised by the cataract operator. There is no operation in surgery where the co-operation of the patient is so much to be desired as in this.

That subtle, psychic condition we call "confidence in the doctor" should be secured.

Within the year I attempted to operate upon the eye of an old woman having only seen her twice for periods of a few minutes. She was wheeled into the operating room, the eye was prepared by strangers, and I, a strange doctor, grasped the eyeball with a fixation forceps, ready to make incision. The psychic shock was too much. She began to retch as if to vomit and continued it with every attempt I made to continue the operation. She was taken back home and never again would make the attempt to recover her sight. The result is she will probably be in darkness to the end of her days.

Other spasmodic symptoms, as coughing, sneezing, commonly complicate this operation. Small doses of morphine will usually prevent either if given a short time before the operation.

In conclusion I wish to repeat that the ophthalmologists of today especially need to keep in closer touch with clinical medicine. It is along these lines that the surest progress will be made not only in medicinal ophthalmology directly but indirectly in ophthalmic surgery.

[No better comment can be made as regards the preparation of the patient than to quote from W. Gordon M. Byers in *Wood's Ophthalmic Operations*. "We strive at present for the complete disinfection of the field of operation and the prevention of contamination, not only from the air (the possibility and importance of which were overestimated by Lister) but from every extraneous source of asepsis. These are our ideals; but that we have so far been unable to realize them, and that circumstances and conditions often compel us to fall back upon the original idea of controlling bacterial processes (antisepsis), is only too well known. Especially is this true of ophthalmology where the local anatomical conditions, which will be dealt with more in detail elsewhere in this section, present obstacles in the way of complete asepsis insurmountable by any means that we now have at hand. Still, the goal is apparent; but undoubtedly advance would be more rapid if the spirit of progressiveness in this direction were more pronounced among ophthalmologists. I say this advisedly, because I am persuaded from wide observation that

oculists as a class lag behind their confreres of every other specialty in the matter of surgical cleanliness.

The reasons for this are apparently not far to seek. Many, perhaps most of them, do not have the advantage of that training in a general surgical clinic without which it is very difficult to secure a thorough grounding in this important department of their work. On the other hand, a knowledge of the practical impossibility of completely sterilizing certain parts of the field of operation, and of the relatively great resisting powers which the ocular tissues possess, breeds a laxness that readily passes into actual uncleanliness. Still, the facts of asepsis are so well established and are so often brought to the attention of the surgeon, both as undergraduate and practitioner, that there is no excuse for negligence or for partial measures, which are not only illogical, but because of our imperfect knowledge of infection, apt to be dangerous. We should rather, as Czermak and Elschnig point out, accept the favorable local conditions which Nature has provided, not as an excuse for greater laxity, but as a stimulus to achieve a fuller measure of success in our work; and unquestionably the practice of ophthalmology will be most rapidly advanced by a spirit of open-mindedness, which speedily adopts every sound procedure indicated by our developing science."—Ed.]

CHAPTER II.

THE INCISION.

By William H. Wilder, M. D., Chicago.

I think it may safely be said that the corneal incision is the most important step in the technic of cataract extraction.

Once a clean, properly made incision of suitable size has been accomplished, the operator has gone a long way toward the successful termination of the case. Failure to make a correct section increases vastly the difficulties and dangers of the extraction, and may introduce complications that will compromise the subsequent recovery from the operation.

In almost no department of surgery does so much depend upon a single thrust and withdrawal of the knife, and for this reason it is not remarkable that so much thought, practice and writing have been expended on this simple incision for the extraction of cataract.

A celebrated French writer on ophthalmology has said "The operation for cataract is the section."

Let us consider for a moment the requirements of the ideal section.

First: It must be long enough to allow the lens to escape easily so that in its delivery the cortical substance will not be stripped from the nucleus, nor the lens be broken up.

Second: It must be so placed as to give this required length without encroaching on the important uveal structures, the iris and ciliary body.

Third: It must be so made that there will be the least possible chance of subsequent gaping of the wound, suturing of corneal wounds not being desirable.

Fourth: With this same idea in mind, it must be made in that part of the cornea which is most liberally nourished, and in which wounds will therefore heal most readily, for primary union of the wound is one of the essentials for success of the operation.

The incision that seems to meet most nearly these requirements is one made entirely in the sclero-corneal junction or limbus and including from one-third to two-fifths of the circumference of the corneal base. If made entirely in the clear cornea, it must embrace at least half or more of the corneal circumference and in such there is greater danger of gaping of the wound.

It was also observed before the days of aseptic surgery that such large corneal flaps were more liable to slough, a danger that is not, however, so great, if strict asepsis obtains. However, it is generally believed that corneal wounds in the limbus are less prone to infection and heal more readily, probably because of greater vascularity of this part.

Except when specially indicated, the section should be in the upper part of the cornea, for in this situation the lips of the wound are held together better by the natural pressure of the upper lid, and even if the eyelids should be opened under the bandage, there is less likelihood of infection of the wound because it is better covered by the lid than if it were laterally or downwardly placed.

Furthermore, if the combined operation is done the coloboma of the iris is nearly covered by the upper lid, and hence there follows less disturbance of vision from "dazzling" than if the coloboma is below or at any point exposed in the palpebral fissure.

The sclero-corneal incision enables us to meet the terms of the third and fourth requirements that have been given, in that with such a section it is possible to make a conjunctival flap. The advantages of such a flap covering a good portion of the corneal wound are obvious. When it is smoothly placed at the end of the operation, it heals quickly thus sealing the wound and preventing the later entrance of infection, and also furnishing a light support so that there is less danger of gaping.

This is particularly desirable in simple extraction, for with a slight degree of irregular pressure on the eyeball, as from a misplaced bandage, or a sudden movement of the eye, there may follow a momentary gaping of part of the wound and an almost inevitable engagement of the iris in it, or possibly a prolapse.

Among the disadvantages of the conjunctival flap is that in cutting it there is apt to be more or less hemorrhage, and the blood may get into the anterior chamber and so obscure the field

for the subsequent steps of the operation. Most of the blood will escape with the extraction of the lens but some of it may remain to become organized in the pupil and add to the difficulties of a subsequent discission of the capsule. But this objection of the conjunctival flap may be satisfactorily met in most cases by the use of some preparation of suprarenalin immediately before the operation. This so blanches the conjunctiva that there is little likelihood of enough hemorrhage to obscure the field.

Another disadvantage is that the flap of conjunctiva is apt to get in the way of instruments used for the iridectomy and the capsulotomy. This can be met by carefully folding the little flap back over the cornea with the back of the knife as soon as the incision is completed. The objection that the flap may get in between the lips of the wound, and so prevent rapid healing, is met by carefully replacing the little flap with forceps and spatula at the end of the operation.

After all is said the advantages of the conjunctival flap in cataract extraction considerably outweigh its disadvantages, and one feels much more comfortable when he knows that the corneal wound is neatly covered by a well-made flap.

In a paper of this length it would be impossible to describe or even to mention the various incisions and modifications that have been practised and advocated by different distinguished operators whose work has contributed to the evolution of the modern section. To study and appreciate this phase of the subject one should consult the excellent *Encyclopédie Francaise d'Ophtalmologie,* Czermak's *Augenärtzliche Operationen,* and the more recent works, Beard's *Ophthalmic Surgery* and Wood's *System of Ophthalmic Operations.*

A brief consideration of a few that have influenced the development of the modern section may not be out of place.

To Jean Jacques Daviel we owe the honor of being the first to practise and teach the method of treatment of cataract by extraction of the opaque lens. Prior to 1752, when Daviel first presented the result of his early work to the Academy of Surgery of Paris, it was the practise of surgeons to treat cataract by a method known as "couching" or pushing the lens back into the vitreous chamber.

Finding this method unsuccessful in a certain case, Daviel was inspired to make an opening into the lower part of the cornea

and remove the lens. The attempt was successful, and the good result obtained stimulated him to practise the same method on other cases, and to improve his technic.

His incision was made in the lower part of the cornea by making a cut with a double-edged, lance-shaped knife, not unlike a narrow keratome, and enlarging to right and left in the line of the limbus with scissors or with a blunt-pointed knife until the section included half the circumference of the corneal base. Through this wound the capsule was opened, and the lens expressed by pressure upon the lids or by the means of scoops.

It is interesting to note that with the difference of its being made downward, this is the incision of the flap operation of today. But it had to go through a great many changes and modifications before it was learned that, after all, Daviel's incision in the limbus was the correct one.

Surgeons took up with the idea of extraction, and modifications and improvements of technic were rapidly forthcoming. Samuel Sharp devised a knife for making the incision with one cut, and he was followed promptly by De LaFay, who had a similar improvement. These operators made a puncture and counter-puncture and formed the flap by an incision downward.

With few exceptions the operators of the latter half of the 18th century made the flap downward, but about 1800 De Wenzel was a strong advocate for the incision upward. Beer made the flap incision downward and devised the famous triangular knife for this purpose.

Then followed other operators, Pelluci, Santerelli, Travers and Friederich Jaeger, who believed in making a smaller section, termed by Jaeger the linear incision, thinking thus to escape the danger of sloughing of the larger flap.

Von Graefe, 1860, recognized the dangers (in those days) of the large flap incision and the disadvantage of the smaller linear incision for extraction of hard, sclerosed lenses. He therefore introduced what he termed the modified linear incision which he made with a narrow Graefe knife. To insure better coaptation of the wound and more rapid healing, he made the incision entirely in the sclera, entering the point of the knife about 2 mm. behind the sclero-corneal junction, making the counter-puncture at a corresponding point opposite and terminating the cut in the

limbus above, the whole incision being about 10 mm. long. An iridectomy was made to avoid prolapse of the iris.

But while this section healed rapidly, it was observed that with it there was greater danger of iritis, glaucoma and even sympathetic ophthalmia, probably because of wounding of the ciliary processes.

Jacobson, in 1864, advocated a return to the old Daviel incision downward, which he made in the sclero-corneal junction, including about half of the corneal circumference, and combined with a large iridectomy.

De Wecker, in 1875, brought back the pure corneal flap, making the incision in the upper limbus to include one-third the circumference of the cornea.

Major Smith in the so-called Indian intracapsular extraction, enters the point of the Graefe knife in the sclero-corneal junction, and makes the counter-puncture through the sclero-cornea of the opposite side, at such points as to have the incision embrace half or nearly half of the corneal base. The incision is made upward and instead of terminating in the limbus, as does the ordinary flap section, the knife is brought out in the clear cornea 1 mm. or 2 mm. from the sclero-cornea, and in finishing the cut the knife sweeps forward slightly so that the wound in the clear cornea may be as nearly as possible at right angles to the surface of it.

There is thus lost the advantage of the conjunctival flap, and one might suppose, owing to the large size of the wound and the manner of terminating it at right angles to the corneal surface, that the danger of gaping would be increased. Smith and his followers claim, however, that this does not occur, and that there is less danger of over-riding of the edges of the wound than if they are obliquely cut, and hence unnecessary astigmatism is avoided.

Assuming then that the sclero-corneal flap incision, as practised in modern times, is to be followed, let us consider some of the points in the technic of its execution.

First as to the instruments.

The speculum, if used, should be of such a pattern that it can be as readily and quickly withdrawn as it is inserted, and its spring should not be too strong. I prefer a light, Mellinger, self-retaining speculum with a weak spring.

Fixation forceps should have teeth that are not so sharp as to cut the conjunctiva, and should be without catch, or so made that the catch can be turned back.

The knife should be of the usual Graefe pattern with an edge straight up to within 4 mm. of the point. Personally, I should select one of medium width rather than a wide one. The point and edge should, of course, be accurately tested before use.

The patient previously prepared lies on a table of a height convenient for the operator. In the preparation of the eye for the operation I like to closely clip the eyelashes of the temporal third of the upper lid border, for these are so apt to touch the edge of the knife as it enters the eye and thus soil it. It is hardly necessary to clip all the lashes, and if some are left they furnish a good means of taking hold of the lid in case of necessity. The lid margins of course should be carefully cleansed in the preparation. A solution of four per cent. cocain should be dropped into the eye four times at intervals of three minutes, and with the last instillation a couple of drops of 1 to 1000 adrenalin chloride solution may be used.

The operator stands either in front of or behind the patient, according to his own preference of cutting away from or toward himself.

The speculum is then gently inserted, and care is taken not to separate the lids so forcibly or widely as to cause the patient discomfort, and he should be gently told not to resist the pressure of the speculum and to keep both eyes wide open. Indeed it is a good plan to insert and remove the speculum once or twice beforehand to give him a little drill on this subject.

In taking hold of the eyeball with the fixation forceps I much prefer to select a point close to the cornea in line with its vertical meridian, the line of the blades being parallel with this meridian, rather than a point opposite the inferior-nasal quadrant. When fixing the eyeball at the nasal side there is too much liability of a fold of the conjunctiva being drawn over the limbus at the point where one wants to make the counter-puncture. However, this procedure may be varied according to circumstances.

This much is important, to place the closed forceps against the conjunctiva at the point to be grasped, then to allow the blades to spread 4 mm. or 5 mm. so as to stretch the membrane at this point, then to press the blades a little more firmly against the eye-

ball in order to seize the firmer episcleral tissue. This gives a securer hold and is not so likely to tear the conjunctiva nor to draw it into folds.

The hand holding the forceps should rest gently on the patient's nose, and care should be taken not to press upon nor drag on the eye with the instrument. The patient is asked to look slightly downward and the eye is held in this position.

Holding the knife firmly but lightly, and making sure that the cutting edge is in the right direction, the operator, resting the little finger on the side of the head, may begin the incision. Before making the puncture, it is not a bad practice to place the blade across the cornea in the position it is desired to have it when the counter-puncture is made, to mark out, so to speak, the course it is about to take.

Then inserting the point of the knife exactly in the sclero-corneal junction at the selected spot, a little above the horizontal corneal meridian, the blade is pushed into the anterior chamber toward the center of the pupil, but as soon as the tip of the blade is seen in the chamber its direction is slightly changed and it is carried straight across to the point of counter-puncture exactly opposite.

Because of the refraction of the cornea, the beginner is apt to make the counter-puncture too far back, and should remember that if the point engages in the clear cornea about 1 mm. from the limbus it will emerge at the right spot in the sclero-corneal junction. As soon as the counter-puncture is made the cutting should begin by pushing the blade on and keeping the edge exactly in the line of the limbus.

There should be no hesitation at this stage, and with the forward thrust the corneal section should be at least half completed. By careful attention to this point there is less danger of the iris getting onto the edge of the knife and being "scalped" as the cut is made. Some operators endeavor to complete the incision with the forward thrust, but unless the knife is extremely keen, this is very difficult.

Then by steady withdrawal, cutting all the time, and, if necessary, another thrust, the incision will be completed. At the termination of the section somewhat more deliberation is necessary to avoid bringing the knife out with a jump, which might cause the patient to start or to squeeze the eye and force out iris,

lens and vitreous. At this stage of the incision, if the knife has been kept in the proper line, the conjunctiva will rise up on the edge of the blade, and as soon as the cornea is cut through, the knife may be turned slightly backward to make a conjunctival flap, if desired, about 3 mm. or 4 mm. in width. The edge is then rotated forward to divide the flap. The little flap should be placed forward on the cornea with the back of the knife, before proceeding to the next step of the operation.

Throughout the whole incision, there should be no hesitation whatsoever, but at the same time no hurry. The knife should not stop moving from the time the puncture is made until the end, or at least until the cornea is nearly divided and the conjunctival flap is to be fashioned. At the same time the operator should not forget the hand that holds the forceps, and should avoid making pressure or pulling on the eyeball.

But "if to do were as easy as to know what 'twere good to do," all of us could make beautiful corneal sections all the time.

Care must of course be taken in the forward thrust that the point of the knife does not come into contact with the side of the nose or the eyelid, causing the patient to start and also soiling the knife. By directing the eyeball slightly outward as well as downward this may be avoided.

Eyes that are deeply placed in shrunken orbits, and those with contracted palpebral fissures, are difficult to operate on, but in such cases I should not hesitate to make a free preliminary canthoplasty, which can be easily done under infiltration anesthesia.

If the point of the knife enters the cornea too obliquely there is danger of splitting it for a considerable distance and thus shortening the wound canal too much. This may be avoided by holding the blade across the cornea for an instant before beginning, to mark out the line of incision, and then drawing back the knife in the same plane and beginning the puncture. If the iris falls on the edge of the knife after a well-placed counter-puncture, it is usually best to proceed with the cut and take away the portion of the iris that has engaged. It usually makes a rather poor coloboma, but the subsequent iridectomy may remedy this.

If, however, the counter-puncture should be made so far back as to transfix the iris at the root, it would be better to gently withdraw the knife entirely and either wait for the chamber to

refill and then begin again, or postpone the operation to another day. Continuing the incision in such a case would mean seriously wounding the iris and probably the ciliary body, with possible disaster in the extraction or serious complications in the healing. It is no disgrace to retire from a fight for a short time to collect one's wits and get a second wind.

Getting a clear mental picture of the proposed line of incision, in the manner mentioned, will often obviate this error for the beginner.

The Linear Incision.

This shorter, straight incision, advocated by Jaeger and certain English operators (Travers, Critchett and others), is valuable for the extraction of soft cataracts that can be broken up easily and removed through an opening in the limbus not larger than one-fourth of the circumference. It seems to me that for such cases it should be more widely practised. The small wound makes accident much less liable, and because it is made with one thrust its lips coapt perfectly and healing is very prompt.

The incision is usually made with a broad keratome in the upper part of the cornea, exactly in the limbus. The knife should be introduced with care so that the plane of the blade will coincide with the plane of the base of the cornea, thus keeping the incision in the limbus. If an incision larger than the width of the blade is desired, it can be made by having the knife cut to one side or the other as it is withdrawn, making sure to keep the incision in the same line. The withdrawal of the instrument should be deliberate to allow the slow escape of the aqueous and thus prevent iris prolapse.

Discussion by Oscar Dodd.

That the ideal corneal section has not yet been devised is shown by the innumerable variations used, each operator striving to avoid the difficulties which occur in the extraction of the lens and the complications following healing. I fully agree with Dr. Wilder that the section of the sclero-corneal junction, made sufficiently large to permit of the easy extraction of the lens, most nearly meets the requirements. A smooth, even incision will do more to obviate complications in healing than any other step in the operation. In order to secure this it is necessary that the

knife shall be properly held exactly on a plane with the iris, so as not to change the direction of the incision or to allow of too early escape of the aqueous.

In the selection of a knife, I prefer one at least 2½ mm. wide, wherever the anterior chamber is deep enough to permit the use of it. With this there is less danger of the iris falling in front of the knife before the incision is completed, and a smoother incision can be made than with a narrower one.

In order to keep the puncture and counter-puncture at the same level it is well to lay the knife on the cornea so as to get it on a plane with the iris, then, if its direction is not changed, there will be no danger of making the counter-puncture either too far forward in the cornea or too far back in the scleral tissue. The incision should be made with as little sawing motion as possible, pushing the knife through on an even plane until the conjunctival flap is reached.

The point at which the puncture and counter-puncture should be made will vary according to the probable size of the lens, as well as its relation to the size of the cornea.

The sclerosed lens of a person of 70 will need a much larger opening than that of a person of 50 or 60 with more or less soft cortex.

The most disastrous mistake which can be made is in making the incision too small, necessitating pressure on the eyeball in the removal of the lens, and in that way bringing about possible vitreous prolapse and injury of the iris if it should become engaged between the edges of the incision.

As my preference is to do simple extraction in all uncomplicated cases, I always endeavor to make a small conjunctival flap. This should be 2 or 3 mm. wide, for, as Czermak has demonstrated, this gives a better result than a wider flap and a more rapid closure of the wound, thus preventing iris prolapse.

When the combined extraction is done, there is danger of prolapse of the vitreous if the incision is made near the periphery. In order to avoid this, many operators have brought the incision down in the cornea so as to end it 2 or 3 mm. from the upper border.

To make a sufficiently large incision, it is necessary to start it at a much lower point in the cornea or much farther back in the scleral tissue. While this reduces the risk of vitreous pro-

lapse it increases the danger of subsequent complications to a large extent. The closure of the wound is not as rapid, and the extremities of the incision come so close to the iris that adhesions of it to the inner side of the wound, or slight prolapses, are very frequent. Should these difficulties occur, the iris, instead of being drawn towards the upper border of the cornea, is pulled forward so as to obliterate the filtration angle over a large area. It is for this reason that glaucoma is likely to follow this incision. I have recently had under care three patients with glaucoma following cataract extraction where the iris was drawn forward in the manner just described. One of them was operated by the intracapsular method and two with capsulotomy. In one patient both eyes were glaucomatous with complete loss of sight in one eye. While adhesion to the wound or slight iris prolapse will cause drawing up of the pupil, with interference of vision, the danger of glaucoma seems much less when the incision is made at the sclero-corneal junction.

Another reason why I prefer the sclero-corneal section is that the amount of astigmatism following operation is less than with the corneal incision. In two extractions by the intracapsular method with the linear incision which I have seen the corneal astigmatism in one case was 10 diopters and in other 13 diopters, making it impossible to get anything like perfect vision although the media were clear. While it is impossible to prevent a certain amount of astigmatism, the farther the incision is brought into the cornea the greater the chance of the over-riding of the edges and a subsequent irregularity of the cornea likely to be produced.

[Failure of the experienced operator to make the incision as desired depends as a rule upon two conditions. Improper behavior of the patient and insecure hold upon the conjunctiva or loss of a secure hold through friability of this membrane. Dr. Beard makes the following suggestion in his *Ophthalmic Surgery:*

"The best point at which to take hold with the fixation forceps in upward extraction is a matter of no mean importance. The point in question is at or near the center of the inferonasal fourth of the corneal limbus; in other words, just beneath the inner extremity of the horizontal diameter of the cornea. To grasp the tissues here affords a much more satisfactory means of controlling the eyeball than does the more generally chosen one of seiz-

ing them in the vertical meridian below the cornea. It is especially effective in preventing torsion of the globe during keratotomy. The jaws of the forceps are placed against the eye closed, then allowed to open. Thus the loose structures are smoothed out or put lightly on the stretch, the object being to obviate picking up too much of the conjunctiva, thereby causing it to overlap the cornea along the site of the proposed incision. The instrument is then pressed more firmly, and a good big bite is taken, and as deep a one as can be obtained. The fold composing this bite should stand perpendicular to the tangent of the limbus. If the conjunctiva proves too friable to insure a sufficient hold, try lower down or even beneath the cornea. The forceps referred to here are without a catch or lock and have broad jaws. If, while the knife is engaged in the section, the fixation becomes insecure because of a purely conjunctival bite, twisting of the forceps on its long axis will tighten the hold. The second finger rests upon the patient's nose, the third and fourth upon the opposite cheek, and the hold is steadily maintained, meanwhile scrupulously avoiding either to press or to pull upon the eyeball."—Ed.]

CHAPTER III.

IRIDECTOMY AS A PART OF THE OPERATION OF CATARACT EXTRACTION.

By Casey A. Wood, M. D., Chicago.

The most important purpose of the iridectomy in cataract removal is to prevent prolapse of the iridic and other tissues and their incarceration between the lips of the corneal or sclero-corneal incision. It also facilitates the extrusion of the lens, and in some instances diminishes the chances of infection while it favors ultimate improvement in vision.

It probably lessens the danger of prolapse by allowing the birth of the lens without stretching and weakening the *sphincter pupillæ* and by furnishing a means of escape for the fluid, semi-fluid and solid débris resulting from the operation as a whole.

Excision of a portion of the iris as a part of the operation for the removal of cataract may be performed some time before, at the same time as, or at a period subsequent to the extraction of the lens.

I have assumed that the performance of a small iridic excision for *optical purposes in central cataract* (anterior-polar, post-polar, certain forms of nuclear opacity, etc.) as well as an iridectomy in any form or stage of juvenile cataract, does not form a part of this symposium.

Preliminary Iridectomy.

A few surgeons, Mooren for example, advocate an early iridectomy in every form of senile cataract—mature or immature, complicated or normal—in which an excision of the iris is called for. There seems no reason for its performance in favorable cases. It is an open secret that about forty per cent. of cataract extractions terminate equally well under any form of operation, even at the hands of the inexperienced. Given a hard, properly-matured, opaque lens easily separable from its capsules, occurring

in the otherwise sound eye of a healthy, readily manageable patient and it matters little how it is extracted. Such a cataract is easily delivered in its entirety whether an iridectomy be done before, during, or after the extraction manipulations. Why then add unnecessarily to the risks, loss of time, expense and anxiety of the patient by insisting upon two separate operative seances in cases where one is sufficient? In other words, in this discussion there ought to be formulated, as nearly as possible, reasons for the performance of a preliminary iridectomy.

Von Graefe first practised the preliminary operation and advised that it be performed a few weeks prior to the extraction. In the pre-aseptic era he found the double operation to reduce the number of infections, incarcerations and prolapses.

The succeeding extraction was found to be less dangerous than the ordinary combined operation, owing to a smaller area of possible infection, the absence or smaller amount of bleeding, the avoidance of anterior synechiæ, and the lessened risk of the iris falling over the knife edge while making the corneal section. Moreover, the primary and less serious intervention undoubtedly has a good effect upon both surgeon and patient; they come to know one another better; some light is thrown upon the probable behavior of the patient when the time for the lenticular extraction arrives; the latter often finds that the ordeal is not so dreadful as he expected; greater confidence in the surgeon is engendered while quieter and more favorable conditions for the healing of the extraction wound are the result.

The surgeon sometimes obtains valuable information about the condition of the lens periphery, and even as to the contents of the posterior chamber, after a preliminary excision of a portion of the iris.

I have on several occasions noted the value of the early iridectomy in determining the character of the globar contents.

I generally make my incision with a keratome two or three mm. from the sclero-corneal junction and carry the point of the instrument forward very close to the anterior surface of the iris. It is well to remember that the keratome is not a spear whose head is to be plunged through the eye coats for the purpose of making an opening in the eyeball.

For myself I prefer to stand behind the patient with the eye rotated and held downwards. The handle of the instrument is

so elevated that the point penetrates the globe at such a tangent as will bring it out in the anterior chamber close to the root of the iris. The handle is now depressed and the opening enlarged by cutting a path with one edge of the blade until the point appears at the pupil. The handle of the instrument is then moved a little to one side and the second edge of the blade cuts its way out so as to make the second wound margin parallel to the first.

An advantage of such a peripheral wound is that when the vitreous is fluid it is very likely to present and to warn the surgeon to be on his guard when the extraction is made.

I believe that in Morganian cataract, or where "milky" or similarly degenerated lenses are present, a preliminary iridectomy should always be made (especially if the cystotome is employed) because the infection of the iridic wound from the "milk" or other irritant, intra-capsular contents is less likely to occur.

Another point. The healthy iris bleeds little or not at all when a portion of it is excised; hemorrhage therefore is almost invariably an indication that it or some other part of the uveal tract has been the site of a previous inflammation, a fact of great importance to the surgeon who is later on to do the extraction.

Hirschberg* believed the preliminary operation to be of advantage in cataract complicated with annular or multiple posterior synechiæ, in patients with only one eye, in conditions that preclude post-operative rest or sleep, in all cases of increased intra-ocular tension and in immature cataract where iridectomy might be employed (as in Bettman's or Förster's intervention) for the purpose of "ripening" the cataract.

Critchett advised it when there is evidently soft cortex, while Kuhnt does the preparatory operation in gout, diabetes and chronic rheumatism; in nervous or over-anxious patients; in eyes affected by posterior synechiæ, cyclitis, or anesthesia of the cornea; and in suspected glaucoma.

Personally, I am in favor of and have done a preparatory iridectomy in about half of my cataract extractions during the past twenty years and, weighing the advantages and disadvantages of the procedure, I am inclined to believe that this proportion corresponds in my practice closely to what might be termed "abnormal" senile cataract.

Deutsch. Zeitschrift f. pkt. Med. 1874, p. 31.

Whenever in operable cases the cataract presents any of the deviations from the well-known "normal" type a preliminary iridectomy should be done. In this category I would include not only the conditions just mentioned but in such others as point to a suspicion of present or past fundus disease, slowness of the pupil reaction to light or accommodation, when the patient is under sixty years of age and in the presence of any form of conjunctivitis, lachrymal insufficiency or nasal disease.

An interval, usually about a month, should be allowed to intervene before the extraction. In most instances, the iridectomy wound closes in a few hours and uniformly heals firmly in a few days. It thus happens that this division of the cataract operation into two sittings does not materially lengthen the stay of the patient in the hospital, while the lessened risk in many cases and the better vision in others, undoubtedly form an unanswerable argument for the operation in the class of cases I have detailed.

Cataract Extraction with Iridectomy in One Sitting.

Although this may not be the place to discuss the merits of the simple *versus* the combined cataract operation it will readily be seen that one can hardly consider the iridectomy at this stage of the procedure without saying something about it. I may, perhaps, be pardoned for quoting from my own chapter in *A System of Ophthalmic Operations* (pages 1198 and 1199) those views on the subject that I have long held: It would require many pages to discuss the merits and defects of the two principal methods of extracting senile cataract. Probably the proper form of inquiry should relate not so much to a decision as to which is the better method, but to an attempt to decide the cases in which one operation ought to be performed in preference to the other. In other words, a selection of cases is called for because it is undoubtedly true that an operator may employ the simple method too much.

The chief complication and, it might be added, the *chief objection to the operation without iridectomy* is the more frequent occurrence in it of iris prolapse and the difficulties in dealing with cortical matter. Both these drawbacks are associated with their attendant evils, uveitis, astigmatism, irregular pupil, secondary cataract, etc., and it is a question whether the simple operation should be done in every instance by one who has not had con-

siderable practice in dealing with the complications that are most likely to occur.

I have already expressed my preference for the simple procedure in most cases of hard, mature cataract occurring in healthy, right eyes. On the left side, or in any case where there are deviations from what might be termed the normal type of senile cataract, I believe that it is wise to make some form of iridectomy.

The exsection of the iris does not materially differ in extraction of cataract from that done for other purposes, except that it ought to be small and that the margins of the coloboma should be carefully replaced before the toilet of the wound is completed. The figures in the text sufficiently indicate the varieties of interference with the iris commonly employed as part of the combined operation. As is well known, the purpose of iridectomy is to lessen the probability of prolapse, glaucoma and post-operative infection. Inasmuch as the results obtained by operators will always vary to a large extent it is impossible to set forth all the advantages and disadvantages of an iridectomy in senile cataract extraction.

Czermak and Elschnig (*Die Augenärztlichen Operationen*, Vol. II. p. 453) give the following as the advantages and disadvantages of both operations:—The advantages of the simple operation are quickness and ease of procedure; the slighter trauma and the barrier to vitreous and ciliary injection on account of the uncut iris; the cosmetic advantage of a round pupil; the optical advantages of the round, central pupil, because of the better visual acuity, orientation, and the screen-like effect of an intact iris; better healing of the corneal wound and, finally, the rarer occurrence of vitreous loss during an operation.

The *disadvantages of the simple operation* are as follows: The necessity for a larger corneal incision, which predisposes to infection and iris prolapse; further difficulties in extracting the lens and in expelling cortical and capsular remains; more frequent secondary cataract and the greater necessity for secondary operations; more frequent prolapse of the iris; the difficulty that some operators experience in performing this operation as compared with the combined extraction.

The *advantages of the combined extraction* are, easier removal of the cataract and cortical remains; a smaller incision and, consequently, less exposure of the wound surface to infection;

less liability to prolapse of the iris; fewer chances of glaucoma and inflammatory reaction; a greater certainty of the results.

Among the *disadvantages of the combined operation* are greater probability of complication owing to the longer time required for the operation; wounding of the iris, together with the pain and bleeding that attend it; the danger of minor incarcerations of the iris, with capsular remains in the corners of the wound, and of their sequels (cystoid scar, small staphylomata, iritis, irido-cyclitis and sympathetic ophthalmia); slight incarceration of the capsule; inferior visual acuity, diminution of peripheral sight and, in consequence, defective orientation; greater liability to post-operative glaucoma on account of iridic and capsular hernia.

However, the dictum of Terrien (*Chirurgie de l'Oeil*, p. 149) that the simple operation is the procedure of choice and the combined one of necessity or selection (*opération d'exception*) is probably true. In any event, it is better to do an iridectomy in rigid irides, or those that are not quickly affected by mydriatics; in unripe cataracts; in diabetic cases, and whenever there is any suspicion of posterior synechiæ. To this category might also be added hard cataract occurring in high myopes or in patients having any of the undesirable complications elsewhere mentioned. The iridectomy thus made is one rather of prevention and prudence; the unmutilated iris and the round pupil should be retained if possible.

The Technique of Iridectomy in the Combined Operation.

The only point in which I differ from the majority of surgeons is in my decided preference for small scissors (semi-curved on the flat) instead of the de Wecker, Noyes or other form of *pince-ciseaux*, in excising the iris. But this, of course, is merely a personal affair, and is of little importance.

I prefer the Noyes' iris forceps because it is an instrument easily handled, small enough to be retained between the thumb and index finger and more readily manipulated than long-handled forceps.

I have never been able to discover any useful purpose in either long-handled scissors, long handled ophthalmostats or long-handled iris forceps. The personal equation doubtless determines the choice of all the instruments in this operation; in any event

it is not so much a question of *what* instruments as to *how* they are employed that interests us. Each operator should hold and cut off or out the small piece of iris with whatever forceps and scissors he can handle most deftly and with the least discomfort to the patient.

Immediately before proceeding to this manipulation it is well to notify the patient that he may experience a little discomfort but that he must under no circumstances "squeeze up" his eyes but bear with a little momentary pain. The surgeon should again ask him (always in a very quiet and low voice) to look down and

Fig. 1.

Extraction of Senile Cataract

Some of the Iridectomies and Iridotomies Made in Various Combined Methods. [Wood.]

keep both eyes, hands and mouth open. Then, holding the iridectomy scissors closed, with the right thumb and middle finger, and a pair of small iris forceps (also closed) with the left hand I introduce the forceps into the anterior chamber. When the point of the forceps reaches the margin of the iris, the jaws of the instrument should be opened and the iris grasped at this point. Then, by gentle traction, the forceps are withdrawn until the pupillary edge of the iris appears well outside the corneal incision. At this moment the folded iris tissue is cut through with one snip of the scissors held exactly in the vertical meridian of the cornea. If this step is properly carried out the margins of the coloboma thus formed will recede within the anterior chamber. If, after waiting a few moments, there is no disposition on

the part of the iris to do so, it would be well to replace it, either by gently stroking the cornea with the back of a spoon, or by the employment of the iris-repositor.

Modifications of the Ordinary Iridectomy in Cataract Extraction.

As set forth in my *System of Ophthalmic Operations,* (pp. 1200-1203) several operators have devised modifications of the usual operation. Verhoeff makes the corneal incision in the usual manner. The iris is then grasped with the forceps as near its root as possible and a small bit of tissue excised with scissors so as to leave a small hole in it. (See figure 2.) The iris will im-

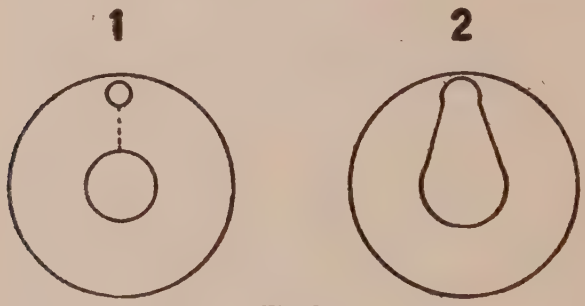


Fig. 2.

Verhoeff's Modified Iridoëctomy as Compared with the Usual Iridectomy.

mediately return to the anterior chamber of its own accord. de Wecker's small iris scissors, preferably with blunt-pointed blades (Noyes' scissors will probably serve as well), are then introduced through the corneal incision, gently opened, and one blade passed downward through the hole in the iris until it projects below the pupillary margin. The blades are then quickly closed, thus making a clean cut through the iris to the pupil.

Owing to the mydriasis produced by the cocain, the edges of the incision will separate, usually at once, as widely as after an ordinary iridectomy. (See the figure.) If, however, the iris is pressed against the cornea by the lens, this may not happen until after the lens has been extracted. The lens capsule may now be opened with the cystotome or capsule forceps and the lens expressed in the usual way, or the latter may be extracted in its capsule. In making the toilette of the wound, care should be taken, as after iridectomy, to free the pillars of the coloboma

from the incision. It is probably best to instil atropine immediately after the operation, since this enlarges the coloboma and thus lessens the danger of iris prolapse.

This operation offers the advantages of both the simple and combined operations without their disadvantages. The lens is removed with the same ease as in the combined operation, the danger of iris prolapse is minimized, and cortical matter can be expressed with even greater facility than after an iridectomy. Moreover, the modified iridectomy requires no such rough handling of the iris and causes no such pain as iridectomy, while it is superior to the latter in its cosmetic and optical results. The excision of iris tissue is made where it will be most effective in preventing iris prolapse and at the same time do the least damage from an optical standpoint.

In the case of iridectomy, a large section of the sphincter muscle is always removed so that the reaction of the pupil to light is necessarily much impaired; the claim in this operation is that the sphincter muscle is simply incised and the pupillary reactions less interfered with. For this reason, as well as on account of the narrow coloboma finally obtained, the dazzling on exposure to bright light often complained of after iridectomy is, after this method, notably absent. The optical results are, in fact, practically as good as after the simple extraction or the Chandler button-hole operation.

Chandler, to prevent prolapse of the iris, makes a small peripheral button-hole opening in that membrane after the delivery of the cataract. At first he simply perforated the iris with his knife, but he now removes a piece of tissue 1 mm. in diameter, making the round opening as near the root of the iris as possible. The object of this small, circular opening is that it not only allows drainage of the intraocular fluids but the cortical matter that collects above and under the iris can be pressed through the opening. Moreover, in washing out the anterior chamber the fluid flows backwards through the opening and carries with it all the cortical débris. In performing the operation Chandler tries to make his cut exactly at the scleral-corneal junction. After the lens has been delivered, he allows the iris to prolapse for a few moments, knowing that he can remove cortical matter through the perforation in it.

As a result of this method he has had only three cases of

vitreous loss in 312 extractions. Among these were four cases of prolapsed iris; two of them were the result of direct violence. In two others it occurred on the second day; the opening having been made too far forwards. Chandler uses forceps with the teeth at the tip and scissors whose blades are very thin; otherwise the opening is made too large and farther down than it should be. The opening is made after the expression of the lens, as it seems that the small amount of aqueous under the iris acts as a buffer and facilitates its extraction.

BOSTON MEDICAL LIBRARY SEP 28 1916

Iridectomy in the Removal of Cataract in its Capsule.

D. W. Greene (Wood's *System of Ophthalmic Operations*, p. 1281) expresses the following opinions of this procedure in the Smith operation, and in his own modification of it:—"The Jullundur method is as follows: One blade of the iris forceps held in the left hand was held on the posterior lip of the wound and the other on its anterior lip. By pressure downwards (more on the anterior than the posterior lip) the iris was made to prolapse, was caught as the forceps closed, and cut in the direction of the section by the scissors held in the right hand. An advantage of such an iridectomy is that no instrument enters the anterior chamber."

"While in Jullundur I was permitted, at my request, to make the iridectomy as I had made it for many years, viz.: by passing the points of the forceps well inside the section (if necessary) and catching a small bit of iris, drawing it out and cutting it off from below upward. By pressing the scissors downward across the section a more peripheral (the important thing) iridectomy can be made."

Greene expresses the further opinion "That *any* cataract operation will be safer if the iridectomy is performed from two to four weeks (or longer) before the extraction. I have proved this contention to my own satisfaction in making a test of the value of a small preliminary iridectomy with the incision back in the limbus in 100 cases."

He also thinks that "There is in intra-capsular extraction a tendency to drawing up of the pupil which I am convinced would be best counteracted by a preliminary operation; otherwise by a small iridectomy made as peripheral as possible at the time of the corneal section."

Complications of Iridectomy.

During the operation even a careful operator, in his anxiety to remove as small a portion of the iris as possible, may find after the use of the scissors that he has made a "button-hole" opening in that membrane. This generally follows the seizure of the iris too near its base.

The iridectomy can still be carried out by passing in a Tyrrell's hook, drawing out the little band of uncut tissue and snipping it with the scissors. Herbert (*Cataract Extraction,* p. 97) advises that:—"The narrow strip of tissue may be readily hooked upwards by the cystotome (held in the right hand) after the capsulotomy has been done. If very narrow it tears readily; otherwise the loop is released, and the forceps and scissors are again taken up. The forceps are used so that one blade passes down in front, and the other, generally more or less embedded in soft lens matter, behind the band. This will still be found lying near the wound, retraction being interfered with by the sticky lens substance. The points of the forceps being closed beyond the band, the latter may then be readily hooked up and cut away. Or if the eye be very unsteady the forceps may be dispensed with. The left hand may be usefully employed with the curette or expressing hook. Pressure is applied at the lower edge of the cornea, as for expulsion of the lens. The wound is thus forced open, and the little band of iris stretched and carried forward on the presenting lens, either into the wound or near it, so that it may be easily cut with scissors. Usually the strip of iris may be made to present sufficiently well for the scissor blades to be applied transversely, snipping off lens substance together with the iris. Should by chance a long tag be left attached to one angle of the coloboma, this shrinks afterwards, but forms a posterior synechia."

Besides this complication one may have a free and embarrassing *hemorrhage into the anterior chamber* which may render quite difficult the subsequent capsulotomy and removal of cortical matter.

Detachment of the iris or an irregular rent or wide tear may also occur, generally a result sudden and unlooked for. Although every operator knows that he should never relax his vigilance for one instant and expect every untoward incident during all the

steps of an extraction, yet these accidents may follow sudden movements on the part of the patient after the iris is grasped with the forceps. It is on account of the possibility of these complications that many operators inject a drop or two of cocain solution into the anterior chamber immediately after the corneal incision. When either of them does happen a clean incision of the strands or shreds of the iris should be made and great care exercised that no tags remain in the corneal wound.

Iridectomy after the removal of the lens and before the complete healing of the bulbar incision is generally done because of threatened or actual prolapse in case of simple extraction or in those combined instances where at the angle of the corneal wound an incarceration has occurred.

In the first complication the wound is opened if necessary, the iris carefully drawn out of the wound and excised in the usual manner. The repositor is now brought into play and a firm bandage applied. Some surgeons also keep the eye under the influence of eserin but I have never been able to see that this, or any other agent, does any particular good in such cases.

As Knapp pointed out, a wide and peripheral iridectomy is a prompt and effective remedy for the glaucoma that occasionally attacks eyes from which a cataract has been extracted by the simple method.

Of the iridectomy employed in treating massive exudates, anterior synechiæ, etc., complicating and following cataract extractions it is not necessary to speak, especially as there is nothing in the procedure itself of special importance.

I may add to the foregoing that although my observations and conclusions are based upon a comparatively small number of cataract extractions, i. e., 1160 public and private cases during the past twenty-two years, yet most of them have been in private patients whose subsequent fate I have been able to follow with a fair degree of accuracy.

Discussion by Willis O. Nance.

Dr. Wood, in his usual masterful style, has so fully covered the essential points of this subject that there remains little of importance to be added.

Iridectomy when performed as a part of the operation for the extraction of cataract is by no meaans one of the least im-

portant steps of this delicate procedure. In fact its performance in many instances requires not only operative skill but an intelligent command of the patient's emotions. It is the one step in cataract operation which may be accompanied by pain, a feature which must be always considered, and the successful operator must ever be ready to meet with emergencies as they may arise. We have all seen patients perfectly oblivious to pain when the conjunctiva was grasped with the fixation forceps, and who were absolutely quiet during the completion of the corneal incision, but who when the iris was grasped with the forceps and gently drawn out acted as though they were about to climb off the table or rise up and disastrously terminate the proceeding. The operator may at times by diplomatic reasoning circumvent such a catastrophe but he must always be ready in every case to instantly release his hold on the iris should occasion demand. As stated, some surgeons, after making the corneal incision, instil a drop or two of cocain solution into the anterior chamber. I have done this in two or three instances where trouble of the kind mentioned was feared, with satisfactory results.

Another class of patients occasionally met with are those in which no amount of coaxing or urging will induce them to rotate the eye downward. This condition when met with is exceedingly exasperating to the surgeon. In a few instances of this kind I have been obliged to give the fixation of the eye over to an assistant, open the corneal wound by slightly pushing the flap forward, to be held by the assistant, and drawing up a section of the iris and abscising it.

In a considerable number of extractions with iridectomy I have met with the two conditions just mentioned and I cite them believing them to be of interest to every surgeon.

Dr. Wood has considered very exhaustively the question of preliminary iridectomy *versus* iridectomy and extraction at one sitting. I agree with his conclusions that "whenever in operable cases the cataract presents any of the deviations from the well-known normal type a preliminary iridectomy should be done." In the so-called "normal" cases I believe preliminary iridectomy to be unnecessary and from the standpoint of the patient a hardship so far as time, expense and worry is concerned.

The proportion of cases in which I have done the preliminary operation is less than one-third of the whole.

One class of cases in which I almost invariably insist upon preliminary iridectomy is that in which the patient's fellow eye is irretrievably blind. Should the result of the operation be precarious I have at least the satisfaction of feeling that I employed a procedure which is considered one of caution by most surgeons.

The question of simple *versus* combined extraction is one over which I have never lost much rest. Dr. Wood believes with Terrien that the simple operation is the procedure of choice. I do not disagree with either of these distinguished surgeons. The appearance of an aphakic eye with a perfectly round pupil, with no visible evidence of operative interference is one of the most beautiful and conspicuous accomplishments of ophthalmic surgery. And yet I seldom do the simple operation. I believe the combined operation applicable to practically all cases, safer from the standpoint of both operator's and patient's interests. Especially to the surgeon who has an operative reputation to make, I recommend the combined operation.

The question as to size and location of the coloboma has been considered. I have found by experience that it is not always possible to regulate the exact amount of iris to be excised. I usually endeavor to create a rather narrow "key-hole" opening. In a number of cases I have "button-holed" the iris and have extracted the lens without difficulty or subsequent ill effects. In a case operated quite recently a bridge of iris which remained interfered momentarily with the birth of the lens. With a Tyrrell's hook the "bridge" was brought to the wound opening and separated and the lens immediately presented.

To assist in the creation of a narrow coloboma a hook has been employed by some operators in lieu of forceps. I have never used this instrument for fear that a sudden movement on the part of the patient might render difficult instant release of the iris from its hold.

Iridectomy after extraction of the lens is a procedure that I have seldom employed and as I comparatively infrequently do the "simple" operation it concerns me little.

In conclusion, permint me to suggest, as the result of personal experience, two or three essentials to the performance of a satisfactory iridectomy: (1), sufficient illumination of the eye; (2), complete anesthesia; (3), intelligent control of the patient.

No matter how skillful or ambidextrous the operator may be, without these conditions the operation is likely to be unsatisfactory if not disastrous.

[In performing iridectomy, the editor always prefers the scissors of De Wecker, used as described by Friedenberg (Claiborne, *Cataract Extraction*). "The iris is cut off as close as possible to the cornea by means of De Wecker's scissors or an ordinary curved iris scissors, slight pressure being made against the lips of the section with the scissors, and the iris cut through in two strokes. It is well to draw the iris a little away from the angles of the wound as the cuts are made, in order to free it as much as possible and to aid complete reposition. De Wecker's scissors may be held at right angles or parallel to the corneal section and the iridectomy done with one snip. In the former case the coloboma is narrow with parallel or slightly converging margins. When the scissors are held parallel to the corneal section, the iridectomy is broader and the margins diverge, the amount of this divergence depending on the amount of tissue cut away near the ciliary attachment. This varies directly and in proportion to the pressure on the wound with the scissors, i. e., the length of the cut, and with the amount of iris drawn out with the forceps."—*Ed.*]

CHAPTER IV.

THE CAPSULOTOMY.

W. A. Fisher, M. D., Chicago.

The lens may be removed in its capsule, the so-called "intra-capsular operation;" the anterior capsule of the lens may be cut in various ways, or a portion of the anterior capsule may be removed and the lens extracted, leaving the remainder of the capsule in the eye. Advantages and disadvantages are claimed for each of these methods.

If the lens is removed in its capsule, without accident during the extraction, good vision and rapid recovery can be expected, since there is no capsule or cortical débris left in the eye to cause inflammation with consequent loss of vision; and nothing to obstruct the vision when the eye has recovered from the operation; an obvious advantage being that it is never necessary to perform a secondary operation. The greatest number of objections to the intra-capsular method come from those operators who are least familiar with this operation.

Many operators prefer a capsulotomy and contend that it has superior advantages. The principal claim advanced for it is that the lens is more easily extracted after the capsule has been opened.

The objections to capsulotomy are many, the chief one being that the capsule is left in the eye, and usually some of the cortical matter. These may cause total loss of vision from irritation and inflammation, or partial loss of vision from thickening of the capsule, thereby necessitating a secondary operation. Furthermore, the opening in the capsule may close, rendering another operation necessary.

Object of Capsulotomy.

The lens capsule is opened in deference to the prevalent idea that it permits the lens to escape more readily than it would

while in the capsule. It is also maintained by many operators that there is less danger of complications arising when a capsulotomy is done. Certainly, we have made far more observations with this operation than with the intra-capsular method, probably because most operators are more familiar with the capsulotomy method.

Should Capsulotomy be Performed?

If the average operator can remove the lens in its capsule without subjecting the patient to increased danger during the operation, other than he would by the capsulotomy method, it

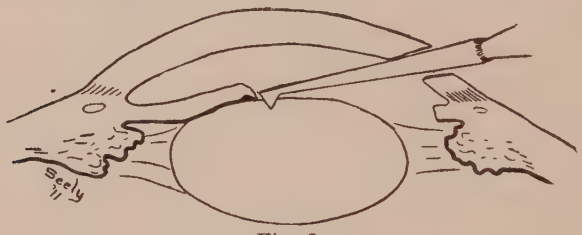


Fig. 3.
Cystotome in position; patient looking down.

would seem that capsulotomy should not be the method of choice, for the reason that post-operative dangers are greater when capsulotomy has been performed. He is a wise man who seeks to avoid an added risk.

Capsulotomy Methods.

There are four methods of opening the capsule. In whatever manner capsulotomy is performed, the object is to make a permanent opening in the anterior capsule, thus reducing the necessity of a secondary operation.

First. By opening the capsule with the point of the cataract knife in transit when the incision is being made. This method is used at present by only a very few operators.

Second. The capsule is opened six hours before the operation for extraction of the lens. The author has had no experience with this method.

Third. The method usually employed, and the most popular one, is made with the cystotome (Figure 3). The opening is made in the capsule in various ways, some making a circular

incision, others a horizontal and vertical incision, an incision corresponding to the letter A, a V-shaped one, or a crucial, while Knapp advocated an incision parallel to the corneal wound. No matter what kind of an incision is made with the cystotome, the instrument should always be introduced into the anterior chamber and pushed forward into the eye with the back of the instrument looking forward. When the instrument is sufficiently advanced it should be rotated one-fourth on its long axis in order to bring

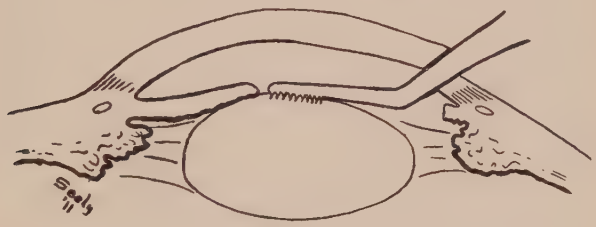


Fig. 4.

Capsule forceps in position; patient looking down.

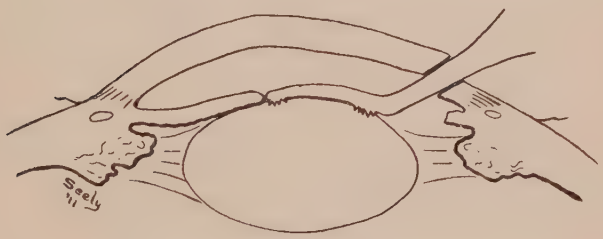


Fig. 5.

Tooke capsule forceps in position; patient looking down.

the cutting edge directly in contact with the lens. After the capsulotomy is finished, the cystitome should be turned one-fourth over, in order to remove the instrument with the back coming out first. Manipulated in this manner, there is no danger of getting the instrument entangled in either the cornea or iris.

The fourth method, and the one that appeals to most operators, is the removal of a section of the capsule with the capsule forceps. I do not deem it necessary either to mention or describe the various forceps that have been devised for this operation. With any of them a skilled operator can remove a piece of the capsule. While most operators acknowledge

their advantages over the cystotome, yet they fear to employ them on account of the complications which may arise from their use. All of the forceps which have been devised for the removal of the capsule, except those of the author, are made in such a way that the patient *must* look down in order to introduce the forceps into the anterior chamber in a capsule-grasping position (Figures 4 and 5).

When the usual capsule forceps are used there are two great dangers. The first is that the patient must look down in order to introduce the forceps. Every time a patient looks down during the extraction of cataract, after the incision has been made, he

Fig. 6.
Author's capsule forceps.

increases the danger of loss of vitreous and with it other complications.

The second danger is that if he looks up while the forceps are in the eye, unless the eye is held by fixation forceps, there is exceedingly great risk of complications, such as dislocating the lens, loss of vitreous, and considerable trouble in removing the forceps. For these reasons many operators have relied upon cutting the capsule with the cystotome, in order to let the lens escape, rather than take the risks of forceps complications.

Most operators, I am convinced, would prefer to remove a portion of the anterior capsule with the capsule forceps if they knew it could be done without danger. For this reason I want to call attention to a capsule forceps which I have devised (Figures 6, 7 and 11), which can be used while the patient is looking up, thus practically eliminating all the danger usually attendant upon the introduction of the ordinary forceps.

In using my forceps there is no danger of dislocating the lens, because the patient is looking straight up at the ceiling when the forceps are introduced. If the patient should suddenly look down, the eye would draw itself away from the forceps without any effort on the part of the operator, and they could be reintroduced at once without endangering the eye in the least.

These capsule forceps are made in two sizes, the smaller being designed for use in small eyes, or a contracted fornix, where it might be difficult to introduce the larger instrument. They are very easy to manipulate, being held loosely between the thumb

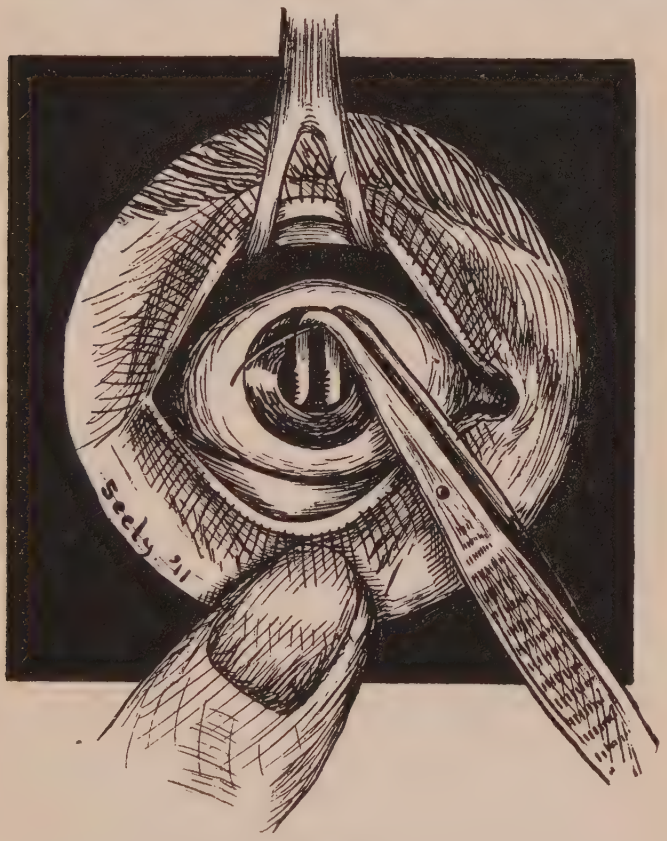


Fig. 7.

Author's capsule forceps in position; patient in recumbent position, looking at the ceiling; upper lid held up and away from the eye-ball with author's lid retractor.

and index finger of the right hand while operating on either eye. It is advisable to acquire an ease of manipulation by practicing their use on a pig's eye, or that of some other animal, before first using them on the human eye. A very little experience will enable one to handle the instrument with surprising ease.

Dr. Wood has completely covered the subject of iridectomy, but I wish to add that it is my preference to have an iridectomy

before the capsule forceps are used, since the capsule can be more readily grasped with the forceps without catching the iris. It is also my preference to have a preliminary iridectomy followed by the removal of the lens three weeks later, to an iridectomy at the time of the extraction, because then it is not necessary for the patient to look down after the incision has been finished,

Fig. 8.
Author's light.

while to do an iridectomy at the time the lens is removed, the patient must look down.

A preliminary iridectomy is so trivial an affair that it is hardly to be classed as an operation. The opening in the cornea with the keratome is so small that there is no danger of the lens escaping, and with modern antiseptic precautions there is little if any danger of infection. The patient can look down while the iridectomy is being done without any risk, but after the incision has been made for the removal of the lens, the patient should never be told to look down as looking down always invites risk. The direction in which the patient should look, after the incision for cataract operation has been made, is straight up at the ceiling, no

matter whether the intra-capsular or the capsulotomy method is to be pursued in the delivery of the lens.

The Light.

In the performance of a cataract operation, a good light is very essential. In doing a capsulotomy with the patient looking up, it is preferable to have a small light which will throw the illumination not only on the eye, but up and under the upper lid. It is very essential that the patient look up when operating with my capsule forceps, and have the field illuminated with a light of this description (Figure 8).

Fig. 9.

Author's lid retractor.

Position of Surgeon and Assistant

To remove a portion of the capsule with the author's capsule forceps, the assistant should stand on the left side and in front of the patient, when operating on either eye. He should hold the upper lid up and *away* from the eye-ball with my lid retractor in his right hand (Figure 9), and with his left index finger or thumb pull the lower lid downward, just making sufficient traction to hold the lids open and away from the eye-ball (Figure 7). In this position the assistant secures the most comfortable position for the patient, is not in the way of the surgeon, and does not obstruct the light; at the same time he can observe the field of operation. This is imperative, as the rôle of the assistant is nearly if not quite as important as that of the surgeon. The assistant does not change his position until the operation is finished. The lid retractor is not removed until after the operation is finished and the eye closed. After the incision has been made, the surgeon should finish the operation by standing on the right side and in front of the patient when operating on either eye.

Dr. Vail will ably describe the methods of removing the lens, but I would like to say at this time that before the capsule is opened, emphasizing Elschnig's rule, the operator can make an

effort at removal of the lens according to the Smith method. With a so-called strabismus hook he can make slight pressure near the inferior corneal margin, backward toward the optic nerve, while the patient is looking up. He may be rewarded by

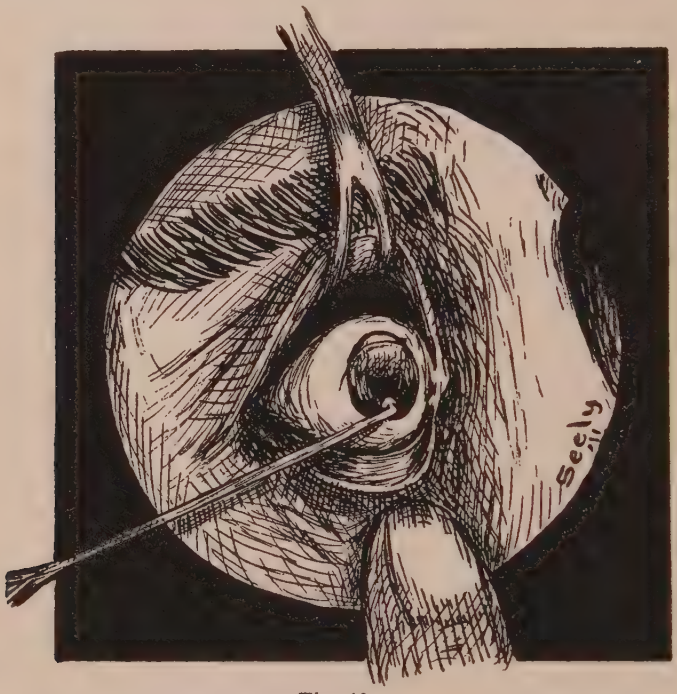


Fig. 10.

Expulsion of the lens; first step in Smith method. Author's lid retractor and Smith hook.

seeing the lens appear in the opening and with slight manipulation he can remove it in its capsule (Figure 10). If the lens does not appear in the wound after slight manipulation of the hook, no harm will have come to the patient and a capsulotomy can then be done in any manner which seems best to the operator.

Method of Using the Capsule Forceps.

With the assistant in the position and holding the lids away from the eye-ball as before described, the operator takes the cap-

Drawings were made by Dr. A. C. Seely, formerly a student of the Chicago Eye, Ear, Nose and Throat College, now of Roseburg, Oregon.

sule forceps between thumb and index finger of his right hand, and introduces the closed forceps through the incision, while the patient, in the recumbent position, is looking straight up at the ceiling. When the forceps are well in, the surgeon opens them, grasps and removes a piece of the capsule (Figure 7). The operation is now finished by following the Smith technique, the same as if an intra-capsular operation was to be performed. This will be fully described by Dr. Vail in the delivery of the lens in its capsule. I prefer to have the assistant hold the upper lid up and

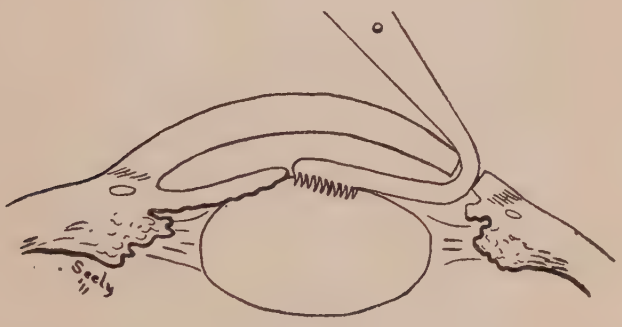


Fig. 11.

Author's capsule forceps in position; patient looking at ceiling.

away from the eye with my lid retractor rather than with the Smith hook (Figure 7). It seems to me to be much less difficult to do, there being no further need of changing instruments from the time the operation is begun till it is finished. *This is very important if the patient is nervous.* The patient continues to look up at the ceiling after the lens is expelled, and the cortical débris can be removed in this position, the toilet completed with less danger than in any other position, and the lid retractor removed without the patient being conscious of it after the operation has been finished and the eye closed.

Fuchs says: "An important improvement has been the introduction of the capsule forceps for opening the capsule. With this the anterior capsule is not only split, but also has a piece taken out of it. Thus, the capsular wound is prevented from closing quickly again, and in this way from resorption of the fragments of the lens that remain. Since the employment of the capsule forceps, secondary cataract has become much less frequent,

although at present unripe cataracts are operated upon much more than formerly."

Most operators will agree with the above quotation from Fuchs, that if the capsule is to be opened it is desirable to remove a piece of it, provided it can be done without increased danger.

To summarize: (1) The lens may be removed without capsulotomy, which procedure, if successful, yields more rapid and better visual results.

(2) Many operators still prefer capsulotomy, which may be performed with the cystotome or capsule forceps.

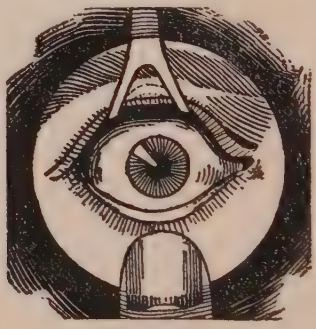


Fig. 12.

Author's lid retractor in position.

(3) Capsulotomy with forceps is attended by the danger of a sudden upward movement of the patient's eye, but this danger is removed by the use of the author's forceps.

(4) Capsulotomy is easier to perform and attended with less danger if preceded by a preliminary iridectomy.

(5) The position of the operator, his assistant, the method of holding the lids away from the eye-ball, and the position and character of the light used, are of great importance.

Discussión by Harry S. Gradle.

Cataract has been operated upon in one manner or another ever since the early Egyptian periods, although its nature and location was not recognized until the mediaeval ages. Our present operative methods date from Daviel (1745), who operated both with and without capsulotomy. He used a fine lancet and if the capsule were thickened, made a circular incision, removing

the detached piece with a delicate forceps. The first individual capsular instrument, a cystotome, was constructed by de la Faye in 1755 and operated within a guard like a pharyngatome. Palucci used the point of his cataract knife to open the capsule and his example was followed by the majority of operators until the middle of the nineteenth century. The sharp hook cystotome was popularized by v. Graefe and v. Arlt, but both of these men used a forceps for thickened anterior capsules. The use of capsule forceps in non-thickened capsules was introduced by Forster.

Extraction of cataract within the capsule (Smith operation) also dates from Daviel, and de la Faye who operated six cases by this method in 1753, and it was performed intermittently by many operators, including Sharp, Richter, Beer, etc. Chritiaen in 1845 again brought the intra-capsular expression to life and simplified it by removing the lens under pressure alone. The indications for this operation were first definitely stated by Pagenstecher in 1866. But as Hirschberg said, "It is impossible to separate the name of Smith from this operation because of the enormous experience that he has had." Yet Hirschberg does not give Smith enough credit, for the Indian surgeon introduced the refinements that added so to the safety of the operation. The lid hook was his idea, but more important were his directions to the patients in regard to looking upward.

As not all of us have had the opportunity of studying Smith's operation at first hand and therefore have not the necessary experience in regard to the clinical and practical details, I believe we should follow the course emphasized by Elschnig, "Continue the expression only when the edge of the lens appears in the wound upon light pressure." I do not think that the expressio lentis is so universally applicable in this country as in India, because of racial differences. There must be a difference in the adhesion of the posterior lens capsule and the hyaloid membrane and it stands to reason that the zonule fibres are more pliable in younger people. In consequence, we who operate upon the Caucasian race should select our method of operating with due regard to the patient's age, degree of sclerosis, etc., and that the capsulotomy should not be entirely neglected in our operative teachings.

The capsule forceps advocated by Dr. Fisher certainly are a valuable addition to our armentarium, for we all know the danger of sudden movements upwards by the patients and when this can

be eliminated, as it is by these forceps, our chances for a perfect result are increased.

[The editor has occasionally used capsule forceps and has attempted the construction of an instrument to cut out a piece of the capsule, but it was of such bulk as to almost prohibit its use. He has used the capsule forceps of Fisher, but believes that more capsule can be removed if the membrane is first incised with the cystotome.—Ed.]

CHAPTER V.

THE DELIVERY OF THE LENS.

By Derrick T. Vail, M. D., Cincinnati, O.

The crystalline lens consists of three anatomical divisions, viz.: the capsule, the cortex and the nucleus. In the operation of "cataract extraction," or more properly speaking "cataract *expression*," we have two radically different procedures to consider, which comprehend these anatomical divisions. First, delivery of the lens-nucleus and cortex, leaving within the eye all or the greater part of the capsule; and, second, delivery of the entire lens in its unopened capsule. The former is known as the "capsulotomy" method, the later the "intra-capsular" method.

There are different ways of delivering the lens by each method. I shall not attempt to describe all these in detail, or in fact to even mention them. The student can consult the literature for himself. But I shall describe in detail the methods I have employed in many cases and which I therefore know from personal experience.

PART I.

Let us first consider delivery of the lens after the capsule has been opened by the method described by Dr. Wm. A. Fisher in the preceding paper. You will remember that the upper lid is held away from the eye-ball by the assistant, as described by Dr. Fisher, during his method of dealing with the capsule by means of his capsule forceps. This control of the upper eye-lid is maintained by the assistant, unaltered in any way, until the lens is delivered and the operation finished. In my experience nothing yet offered for this purpose is equal to the lid-hook of Col. Henry Smith, of India (Fig. 13). The patient will naturally assume the "first position" of the eyes in which all the ocular muscles are relaxed, or in other words, he will *naturally look straight ahead or slightly upward*. Thus a considerable area of the sclerotic

below the cornea is exposed. When this position of the eye is assumed nothing is said to the patient. The operator will now take the lens-spoon in his left hand and the "lens-hook" or "strabismus hook" of Smith in his right, holding each as he would hold a pen. The left hand is laid lightly on the patient's face and the

Fig. 13.

Showing the correct pose for the assistant to assume in exposing the eyeball for delivery of the lens and also showing the natural position the eye of the patient assumes. This is the most favorable position of the eye.

end of the lens-spoon is held in close proximity to the wound for emergency use. The lens-hook held in the right hand, is used to express the cataractous mass (Fig. 14). He will apply the *elbow* (greatest convexity) of the lens-hook to the cornea just above its lower margin, at the point or line corresponding to the circumlental space, and make deep enough pressure toward the depths of the eye to cause the lens to start from its bed. This will cause the wound to gape by virtue of two forces; first, the depression in the eye-ball with the lens-hook causes the corneal

lip of the wound to leave its approximation to the scleral lip in obedience to natural laws under such conditions, and second, the lens which is driven from its bed by the pressure of the hook takes an upward course, which is the direction of least resistance and will present its wedge-like margin in the incision, thus causing it to open. The pressure is carefully increased without changing its direction until the greatest thickness of the lens is about to pass through the incision, when it is best to pause a moment to accommodate the tissues to the decreasing tension about to ensue

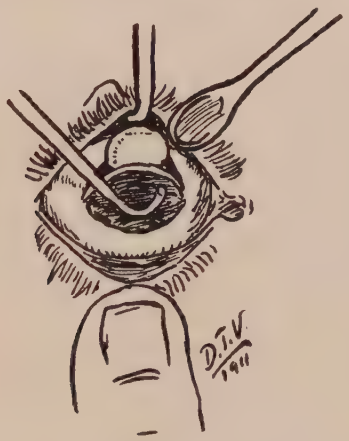


Fig. 14.

Showing the lens-nucleus (and cortex) escaping through the wound as the result of proper pressure with the elbow of the lens-hook.

by the escape of the lens. This interval of momentary rest can be utilized to good advantage in an endeavor to engage as much of the lens mush around the nucleus as possible, so that a good evacuation of the cataractous mass may be effected.

The same depth of pressure is maintained, but the direction is now shifted upward toward the wound to drive the lens and cortex on out. The upward sweep of the elbow of the lens-hook is not completed until the incision itself is reached. The lines of pressure from start to finish represent the tall letter L, lying, we will say, with its vertical arm horizontally, e. g., l—. The short arm of the letter, which now stands vertically, represents the first pressure made against the soft eye-ball at the point designated above, and the long arm of the letter represents the line

of pressure at right angles to this, which is used in forcing or driving the lens on out.

Thus it will be seen that two different purposes are accomplished; first, to tilt and displace the lens and cause its upper edge to present in the wound; second, and as soon as this is accomplished, to force the lens out of the eye-ball by gliding the hook toward the summit of the incision from below upward in the vertical meridian of the cornea (Fig. 15).

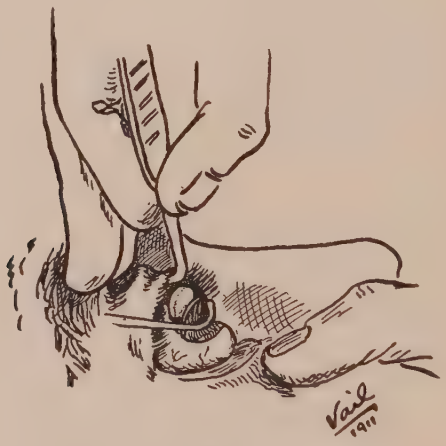


Fig. 15.

Side view to illustrate the same points shown in Fig. 14.

In pursuing this technic, one should have his own eye and hand so well trained that he at no time will exceed the amount of pressure required to accomplish each step in its turn; in other words, he will use enough pressure to accomplish the result and no more. It will naturally follow that after the greatest convexity of the lens passes through the parturient opening in the eye-ball the actual pressure will be lessened to meet the fading requirement to effect the balance of delivery, although the same *depth* of pressure is maintained.

The lens, or, more properly speaking, the nucleus and more or less of the cortex, now lies outside the incision and here is where the angle of the lens-hook becomes useful. The operator will engage the nucleus and as much of the soft lens matter as will naturally cling to it in the hollow of the lens-hook and gently draw it away from the incision along the line of its direction, at

the same time wiping the incision with the convexity of the elbow, or "ironing" the wound, so to speak (Fig. 16). This maneuver, aside from securing the nucleus and the clinging soft cortex, also has, in many instances, the happy effect of causing the iris to unfold its wrinkles, leaving the eye oftentimes with no entanglement of iris tissue in the wound and with a good replacement of the pupil. Inspection will at once decide whether another sweep of the lens hook is needed to clear the aqueous chamber of lens débris.

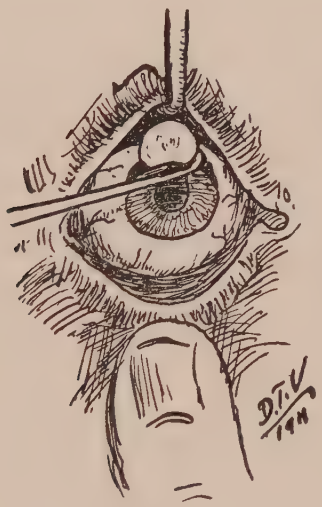


Fig. 16.

Showing how convenient it is to remove the lens from the wound after delivery by using the same lens-hook that effected its delivery.

If soft cortical matter remains in the eye after the nucleus is delivered, it may be, at least in part, forced out by repeating the pressure from the lower margin of the cornea upward to its summit two or three times, to effect, if possible, its delivery from the aqueous chamber and yield a nice, black pupil. Or, if it be preferred, no attempt to deliver this objectionable soft lens matter with the lens-hook need be undertaken, but the aqueous chamber irrigator may be used.

In accomplishing delivery of the lens by the technic above described, the operator must bear in mind that he cannot command a view of the field of operation (meaning the incision and

the on-coming lens) if he stands at the exact head of the patient, as when he makes the incision or performs the iridectomy. He must change his position, moving to the right of the patient (either eye) so that he will stand with his front nearly opposite the patient's right cheek. If he will assume this position, he can easily see the entire field of operation even when the patient is directing his visual axes upward, but to do so he must tilt his own head slightly to his right shoulder and peer obliquely up under the upper eyelid, which, as stated, is being held away from the eye-ball by the assistant (see Fig. 13). This is important to remember.

In describing this technic, I am fully aware that I am not describing the method in vogue in America or Europe. There are diverse methods practised in various countries and by different schools. In fact, no two operators seem to pursue exactly the same methods. Some require the patient to lie flat on his back with or without a pillow under his head. Some require the half-recumbent posture in a reclining chair, and some prefer the sitting posture, the operator facing his patient during the operation; however, they all practise one point in common and that is, that just before delivering the lens, they direct the patient to "look down." There are often vexatious objections to this, for, as ridiculous as it may seem, many patients cannot, or will not, "look down," and the operator being naturally tuned to the concert pitch, will be apt to lose his temper and begin to abuse him. I have heard strong language used on these occasions and have even seen the operator soundly cuff his patient for not "looking down" when told to do so. Such scenes are disconcerting to all concerned and are disgraceful, being entirely uncalled for. If the operator had employed the technic described herein, he would not have had to direct the patient to "look down" at any stage of the operation. The fact of the matter is, that patients, almost without exception, will look straight ahead or slightly up during the cataract operation, for that seems natural, and consequently if the above technic is used not a word need be said about where to look. In this case the operator is master of the situation and his behavior is in keeping with the part he assumes when he attempts so grave an operation as removing cataract.

There is another argument, which, while I personally am not convinced contains much if any force, is considered to be a very

important matter by highly expert operators of vast experience. The claim is made by them that it is courting disastrous escape of vitreous if the patient "looks down" during the delivery of the lens or after. The argument made is that the inferior rectus dragging the eye downward tends to cause the wound to gape. This, it is argued, is because of the nature and position of the wound (being a sharp curve upward), which is a flap-like valve-opening in the eye-ball, the summit of which is not a great way from the insertion of the superior rectus tendon. Thus, it is claimed, in the eye-ball made soft by the incision, aided by the withdrawal of the aqueous, there is apt to occur an unexpected spontaneous delivery or forcible extrusion of the lens and more or less vitreous, if the patient "looks down" too suddenly or too far.

I cannot deny the apparent force of this argument, especially as it seems to be sustained by actual fact, but I have delivered hundreds of lenses and have no fear of disaster occurring to the patient who "looks down" *so long as the lower lid is properly held under control.*

The combined contraction of the orbicularis palpebrarum and levator anguli oris et aliquæ nasi is what causes disaster when a patient "looks down" and this contraction is easily frustrated by the operator who knows this fact and keeps the lower lid depressed against the bone at all times during the cataract operation.

Aside from the great advantage of delivering the contents of the capsule by the method above described, viz., that *the co-operation of the patient is not asked for at any stage,* there is still a greater advantage, and that lies in the fact that the operator may, by employing this or similar technic *before capsulotomy,* succeed in delivering the lens *in its capsule* and that, too, by the employment of very safe and moderate pressure, thus at once avoiding all the manipulations, massagings, instrumentations, irrigations, etc., incident to opening the capsule and extracting piece-meal.

If this can be safely done we at once avoid the vexations and disappointments that follow to both operator and patient where after-cataract, membranous cataract or capsular remains have to be watched, treated, explained and operated on sooner or later. The operator will find, however, that in attempting intra-capsular extraction, he can make better headway by using the bulbous end

of the lens-hook to deliver the lens instead of the elbow of the hook. (See Part III this paper.)

There is no valid reason that I know for denying the patient this attempt at delivery in the capsule prior to the capsulotomy step. No harm is done if the lens should refuse to come out by the employment of moderate pressure, for the operator can abandon the attempt and proceed with Fisher's forceps to secure the anterior leaf of the capsule by merely dropping the lens-hook and using them. These forceps are admirably adapted for seizing the anterior capsule while the patient is looking straight ahead or upward. After their use the lens-hook is again used to express the nucleus and cortex without requesting the patient to change the direction of his eye.

Difficulties that may Arise.

If all cataracts were "nice and ripe" at the time of operation, there would not be such volumes written on the subject. But unfortunately all are not so, in fact, less than half of them are ideal from an operative standpoint. Many cataracts never become mature in the sense that we have a medium-sized nucleus, a moderate amount of recently disintegrated cortical substance and a thin smooth capsule. It is not my privilege here to discuss the kinds of cataract that we are called upon to remove that are not ideal. No operator of experience will deny that capsulotomy is difficult or impossible to perform in many instances, owing to thick, wrinkled capsules, normal capsules closely adherent to live lens fibers surrounding a cataractous nucleus, capsules covering shrunken, discoid lenses and large, hard cataracts apparently all nucleus, not to speak of luxated or subluxated lenses or calcareous cataract and the various forms of capsular cataract, dense post-polar cataract, etc. In any and all of these, we may find every evidence of the existence of a normal fundus and we are called upon to operate under these conditions, be they what they may. I have studied this subject deeply and am firmly convinced that in these cases, as well as in the cases of immature cataract, which make up the majority of the cataract patients who come to consult us, the capsulotomy operation should not be even attempted.

But this article so far is an attempt at instructing the operator how to deal with cataract when casulotomy has been successfully

done and we now come to the difficulties that arise and how they may be met.

First: On making pressure with the lens-hook (or Daviel's spoon) in the attempt at forcing out the lens and débris after capsulotomy, the lens may show a stubborn resistance and refuse to present. In these cases if we apply the bulbous end of the lens-hook to the cornea opposite the circumlental space below (see Fig. 19) and make pressure toward the depth of the eye, we may succeed in starting the stubborn lens. But in some cases this will not suffice. The wound does not gape, or if it gapes, the iris seems to be holding back the lens, as is noticed through the gap of the wound. The trouble is that the attempt at capsulotomy was not successful and the lens-nucleus cannot escape. This may be because the capsule was not cut at all, or, if cut, that the live lens fibers to which the capsule is firmly grown refuse to part company with it. In either case, if the capsulotomy operation is determined on, the proper course to pursue is to abandon attempts at delivery and renew the attempt to complete or effect a successful capsulotomy. If the cut through the capsule is deep and long enough, as can only be effected with a very sharp capsulotome in the cases of unripe or hard cataract, so as to include the entire thickness of the capsule and if possible some of the underlying laminæ of lens fibers, another attempt at forcing out the nucleus will meet with success. It is in this instance usually well to apply the edge of the lens-spoon, which, it will be remembered, is held in the left hand, to the scleral side of the incision (see Fig. 23) and gently depress it while making the pressure on the cornea below the lens with the lens-hook held in the right hand. The nucleus can thus be delivered, but there is in certain cases apt to be a considerable amount of clear lens fibers left behind which, if allowed to remain, will soon become opaque, swell and completely fill the black pupil which was left after the nucleus was evacuated. This will result in a dense after-cataract. Such cases require the irrigator to be used.

Second: The incision may be too small to allow the cataract to escape without undue violence to the eye. This oftentimes can only be discovered when the attempt at delivery is made. The remedy will at once suggest itself. Desist from further attempts at delivery until after the incision is made larger by means of

strong sharp scissors introduced carefully and the cutting done in line with the incision.

Third: Vitreous may present or actually escape. This is always the signal for panic, but to an operator who is not a bungler, no panic materializes. The lens-spoon of Smith, which I mention because I consider it the best and which, as before stated, is throughout every delivery held in close proximity to the wound, is inserted in the vitreous chamber just back of the lens and held steadily there as a back stop or inclined plane for the lens to be forced out against (see Fig. 24). Some operators are accustomed to use a wire lens-loop or vectis to rake the lens out, using no external pressure during this act. Others use a barbed wire loop for this purpose. Still others use a Tyrrell hook bent at right angles at the point instead of the usual crook, which is passed below the posterior pole of the lens and made to hook into its substance, thus securing it for withdrawal; and still others again prefer to use no loops, spoons or hooks, but to force the lens out regardless of whether little or all of the vitreous escapes. I have tried and seen tried all these methods. I recommend Smith's method as being the best.

And fourth: the patient may become incorrigible through fear or panic, sitting bolt upright and fighting off all who attempt to restrain him. My method in these rare cases is to try gentle remonstrance, for I never quarrel with a cataract patient at any time, at the same time cast a look to the assistant and give a side nod which he understands at once to mean "chloroform." While the anesthetic is being prepared, I have a little talk with the patient, which sometimes suffices to quiet him, but if he refuses to submit, I will give him a general anesthetic and complete the operation. To do this it is usually necessary to get the consent of the member of the family present. I have never had any bad results from this method of procedure, but fortunately have had very few such cases. While visiting Smith's clinic at Jullundur in the fall of 1909, I saw Smith encounter one such case and he, too, proceeded to finish the operation as I have described.

PART II.

There are several excellent methods of delivering the lens after capsulotomy; but space will only permit me to discuss one

more which is perhaps the one most in vogue in this country (see Casey Wood's *"Ophthalmic Operations"*; Beard's *"Ophthalmic Surgery"*; Friedenberg's chapter in Clayborne's *"Cataract Extraction"*; Week's text-book, *"Ophthalmology"*; H. Knapp in Norris and Oliver's *"System of Diseases of the Eye,"* Vol. III, *et al.*).

Granted that we have a quiet patient, the speculum is left in place. The operator who stands at the exact head of the patient stoops over so that he can see well the field of operation and with Daviel's spoon or a similar spatula held like a pen in his right hand for the right eye, or the left hand for the left eye, he makes pressure on the lower edge of the cornea directly toward the depth of the eye slowly and positively. In his left hand for the right eye, or his right hand for the left eye, he holds a lens-scoop, spoon or vectis, with which he may aid the delivery of the lens by making *slight* pressure on the scleral side of the wound, but more often he merely holds this latter instrument with its tip close to the wound, but touching nothing, having it in readiness to apply wherever needed to aid delivery in case it should be required. The deep pressure with the Daviel's spoon on the lower edge of the cornea is steadily kept up until the wound gapes and and the lens is nearly half out, when it is shifted to follow up the lens or drive it on out of the eye. When the lens is half out, a moment's time should be utilized to gather in the line of march as much of the soft cortex as can be gently massaged in place below the nucleus, as suggested by Wilder. During all this the patient must look slightly down toward his feet, but when everything is in readiness for final delivery, he is instructed to "look down" still further. As he does this, the expressing instrument is held perfectly still and the eye-ball making a downward move will cause the cornea to glide under it, thus effecting delivery of the nucleus and a pretty thorough evacuation of the soft cortex.

The nucleus and lens substance is wiped away from the wound, the speculum is removed, the eye is closed by lifting the upper lid down over the eye-ball by means of the lashes and a wet pad applied.

It is now well to allow three to five minutes to elapse in order to permit a reaccumulation of fluid in the aqueous chamber.

There is no more efficacious way of delivering the remnants of soft cortex after delivery of the nucleus than to utilize the

pressure of the thumb against the cornea with the lower lid lying between, as taught by H. Knapp (Fig. 17). The conjunctival angle of the lower lid margin is well adapted for this and the "feel" of the eye-ball is very satisfactory. Prior to this act, the lower lid margin is wiped clean with a moist cotton sponge that has been boiled. In forcing out the cortical remnants, great care should be exercised not to let the edge of the lower lid come in

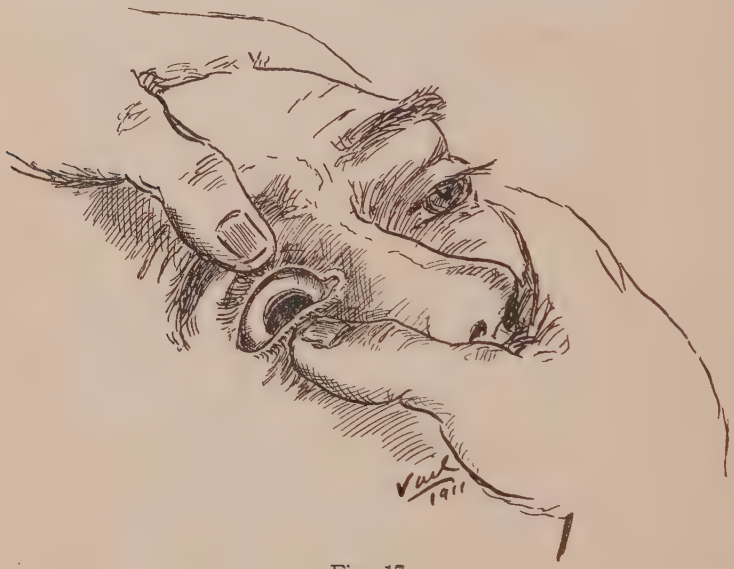


Fig. 17.

Showing Knapp's method of ridding the pupil space of soft cortex after the nucleus has been delivered.

contact with the edge of the incision. It is quite easy to avoid contact with the wound by this technic. A second such attempt to evacuate the soft substance still remaining may be tried, but if that fails, no further attempt should be made. The assistant then takes control of the lower lid and the operator has his right hand free to cleanse the wound. This is done by means of a small pledget of boiled cotton which no one has touched since it came from the sterilizer, and this, after being squeezed, is used to wipe the wound free from capsular remains, lens débris, etc. The iris repositor is then used and the eye closed by grasping the lashes (which in the middle of the upper lid never should be cut) and

lifting the upper lid off the eye-ball and down to its natural position in sleep. *The assistant does not release his hold on the lower lid until the eye is about to be dressed.*

Troublesome Cases.

If the patient is restless or unruly, no speculum should be used. The operator secures the eye-brow and upper lid with the

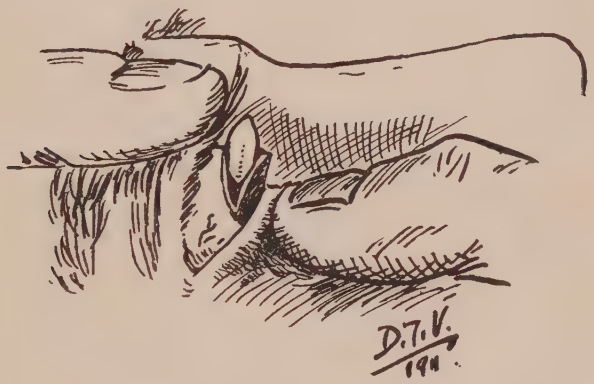


Fig. 18.

Side view illustrating how the nucleus may be successfully delivered in unruly or untrustworthy patients.

forefinger or thumb of his left hand, which is wrapped with gauze, and delivers the lens by using the thumb of his right hand pressing against the eye-ball through the lower lid (Fig. 18). The assistant uses the lens-spoon or wire loop to secure the nucleus after it has escaped through the wound, or, in case of difficult delivery, he may assist in turning the lens out of the wound like a cart wheel. Some difficulty is occasionally met with in unruly patients in having them "look down" and in that case the assistant must hold the lower lid away from the eye-ball with his thumb wrapped in gauze, while the operator proceeds to express the lens with Daviel's spoon, Smith's lens hook or some such instrument.

The *difficulties which sometimes arise* I have already mentioned in *Part I* of this article. The same principles apply in this method as in that.

PART III.

The Intra-capsular Delivery.

Let us first discuss briefly the principles involved in this method of dealing with cataract.

First. The cataract should be uncomplicated with glaucoma in any form, detachment of the retina, myopic choroiditis, senile choroiditis centralis or blood pressure exceeding 200 mm. mercury. We must be very sure in our diagnosis as regards these complications, as they all predispose to expulsive hemorrhage from the choroid.

Second. The incision must be unquestionably large in all forms of cataract except in cases where a deep anterior chamber exists, in which the incision may be moderately sized, but never small. The reason for this exception to the large size of the section is that in cases where deep anterior chamber exists we may nearly always expect to find lenses which do not demand the large section. Moreover, the large section in these cases predisposes to escape of vitreous. This is a logical deduction. To err in making the section too large is always safer and better than to err in making it too small. Conjunctival flaps should be avoided.

Third. An iridectomy is always best. This is not because there is any special difficulty in delivery of the lens in its capsule through the active pupil where no iridectomy has been done; there is not; but because the large section necessarily invites iris prolapse where no iridectomy has been performed.

Fourth. Any kind of uncomplicated cataract can be extracted by the intra-capsular method, no matter what stage it is in, whether immature, mature, hypermature or Morgagnian, whether tumescent, post-tumescent, shrunken or sclerosed, whether capsular, nuclear, post-polar, striated, dotted, hard or pigmented (juvenile, congenital and traumatic cataracts excepted).

In all the varieties just mentioned, with the exception of the "nice ripe" kind, to cut the capsule is difficult, to remove the anterior leaf by means of forceps is often impossible* and to force the nucleus out of the imperfectly incised capsule through a small section is dangerous. Furthermore, in some cases, after the

*I wish to modify this statement by saying I have repeatedly, and with perfect ease, removed the anterior capsule in cases of immature cataract by means of Fisher's forceps in cases where there was a stubborn resistance on the part of the lens to move in attempting intracapsular extraction.

nucleus is expelled, there is enough irritating matter left behind which, while harmless as long as it was imprisoned within the capsule, becomes, if not washed out by a more or less hazardous technic which can only be employed in docile patients, a daily increasing menace to the integrity of the delicate intra-ocular tissues after it admixes with the aqueous, or, more properly speaking, the serum, albumen, inflammatory lymph and aqueous, and permeates and blocks the avenues of escape, being thus locked up within the aqueous chamber of the eye. The after-picture is summed up in the one word "iridocyclitis."

In the intra-capsular operation, the eye is safeguarded against iridocyclitis and dense after-cataract. It is not a partial extraction, but a *radical* one.

There are several very different methods of extracting the cataract in its capsule, e. g., Pagenstecher's extraction by means of a spoon, Wright's combined upward expression, Mulroney's combined lower expression, Smith's "tenotomy hook" expression, Savage's detaching and expressing method, Hulen's extraction by means of a vacuum cup, and other methods mostly experimental in character.

The technic which I shall describe is that of Col. Henry Smith, I. M. S., Amritsar, Punjab, India. I have studied this method minutely under the personal direction of Smith himself in October and November, 1909, at Jullundur, India, during which time I performed 358 extractions* myself and witnessed upward of 600 done by Greene, of Dayton, Clark, of Columbus, Major Birdwood, of Agra, Major Elliott, of Madras, Lieut. Smith (nephew of Col. Smith) of Jullundur, Lieut. Ross, of Jullundur District, Dr. Diwanali (Smith's first assistant at Jullundur) and Col. Smith himself. The technic is the result of an evolutionary growth that gradually developed under Smith's keen eye and trained hand in an experience comprising over 24,000 cataract operations performed on the living human subject during a period of fifteen years. Smith told me in 1909 that he regarded the technic perfected in every detail and that he had not introduced a single new feature since two years prior to that time. The history of any one operation in the archives of surgery does not offer the duplicate of such steadfast, patient and untiring endeavor on the part

*See *Knapp's Archives Ophthalmology,* Jan., 1912, for detailed statistical report of these 358 extractions.

of one man working with honest purpose and self-sacrifice, but alone, unaided and opposed.

I shall now briefly describe Smith's method of delivery of the lens in its capsule, referring the reader to my detailed article presented to the *Chicago Ophthalmological Society,* Nov. 19, 1910, and published in the *Cincinnati Lancet-Clinic,* Jan. 7 and 14, 1911, for a full and complete account of the entire operation.

Delivery of the Lens by the Smith Method.

The assistant takes his stand to the left of the patient with his left hip resting against the solid operating table. With the large short-shank lid-hook of Smith in his right hand, he proceeds to expose the field of operation in the following manner: He holds the lid-hook low down on the shank in such a way that the palm of his hand is open toward the patient's feet and the fingers are straightened out so that the tips of the ring and middle fingers are anchored just under the eye-brow. The brow can thus be elevated on its bony background and maintained in an elevated position until the close of the operation (see Fig. 13). The upper lid is engaged on the hook and gently lifted off the eye-ball. This maneuver, when rightly done, is not the least distressing or painful to the patient and will take the weight of the tissues entirely off the ball, at the same time afford a gable-like exposure of the summit of the eye-ball and the upper fornix. In carrying out these ideas he should hold his elbow high in order to allow room for the operator to approach the eye on both sides of the forearm and wrist. With the thumb of his left hand he depresses the lower eye-lid. In rare instances, as when the lower lid is wet and slippery, he uses a very small piece of dry cotton under the ball of his thumb. The thumb is slightly flexed and the fingers are extended over the patient's right cheek, the tips grasping the lower jaw to steady the patient's face in case of movement.

The above described pose of the assistant is kept up unaltered until the operation is finished unless vitreous presents. If at any stage of delivery vitreous does present, he slightly tilts the handle of the hook toward the patient's feet in order to put on the stretch all the loose tissues of the fornix, thus half closing the eye, at the same time raising the supra-tarsal soft tissues on the tip of the blunt lid-hook in a tent-like fashion. He will in this case straighten out the thumb, which is holding down the lower

lid, in order to afford room for the operator to continue his operation.

The operator takes his stand to the right side of the patient's head and stoops over so that he can get a view of the upper fornix. He takes Smith's lens-hook in his right hand, holding it in the same manner he holds a Graefe knife when about to section the cornea, and in his left hand he takes the double lens-spoon of

Fig. 19.

Showing where the bulbous tip of the lens-hook is applied in the first effort at delivery in-the-capsule.

Smith. The latter instrument he also holds as a Graefe knife is held in the left hand. The tip of the lens-spoon is placed (concave side facing the patient's feet) close to the cornea, but carefully touching nothing. The lens-spoon is not used at all in at least eighty per cent of the operations; it is merely held with the tip close to the wound to be used in case of emergency, as, for instance, in case of vitreous presentation or impending escape. It must in all cases be held in readiness for immediate use, as one cannot tell at what moment it may be required. The patient is usually looking straight ahead or upward and in either case he is left alone and not requested to do anything.

Upright Delivery: The short end of the "strabismus hook" of Smith (the lens-hook), which is at right angles to the shank, is laid on the eye-ball bulbous tip pointing toward the wound, at the lower end of the vertical meridian of the cornea, so that half

lies above and half below the lower margin of the cornea; or in other words, so that the end of the bulbous tip is about 3 m.m. above the lower corneal margin (Fig. 19). This point corresponds to the lower edge of the lens and the circumlental space adjoining (see Fig. 21A). The handle of the hook is now turned

Fig. 20.

Illustrating deep pressure being applied below the lens and toward the depth of the eye to cause upright delivery. The lens is moving up in the wound and soon the pressure will be shifted to tuck the corneal flap behind the lens.

about one-eighth, so that the bulbous tip of the hook will indent the cornea at the point above described and pressure is now made without vacillation straight back toward the posterior pole of the eye. The tip of the hook thus tilts the lens on its vertical plane (see Fig. 21B), so that the upper edge presents in the gaping wound and as the pressure is made a little deeper, the zonular fibers let go and the lens begins to glide on out (Fig. 20). If this be the case, for there are several varieties to consider, the deep pressure is only maintained (neither increased nor lessened) and the end of the hook is made to follow up the lens (see Fig. 21C). The idea which prevails throughout this performance is

to allow no crack or gap to occur between the lens and either lip of the wound. The upward excursion of the lens-hook is com-

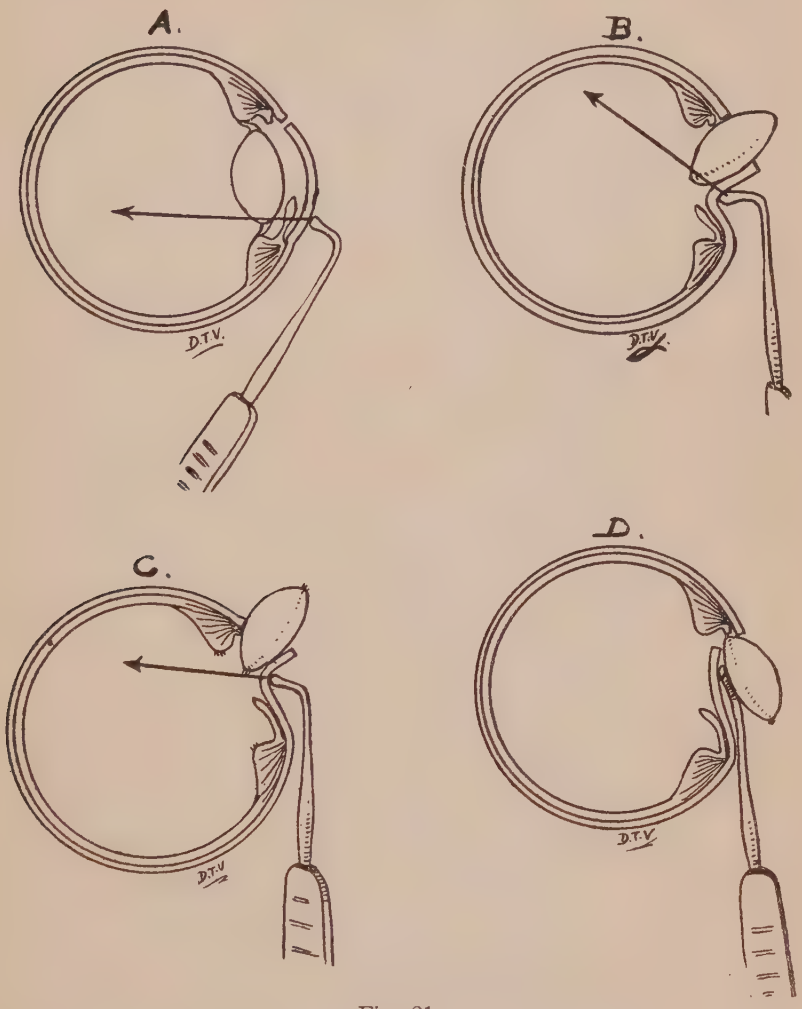


Fig. 21.

A—illustrates the point where pressure is first applied. B—forcing the lens on out. C—tucking the cornea behind it. D—delivery completed and the hook is now to be removed from under the lens and used to rake it away from the wound along the line of incision.

pleted only when the corneal flap is tucked behind the lens (Fig. 21D). The lens at this stage may be entirely outside the eye-

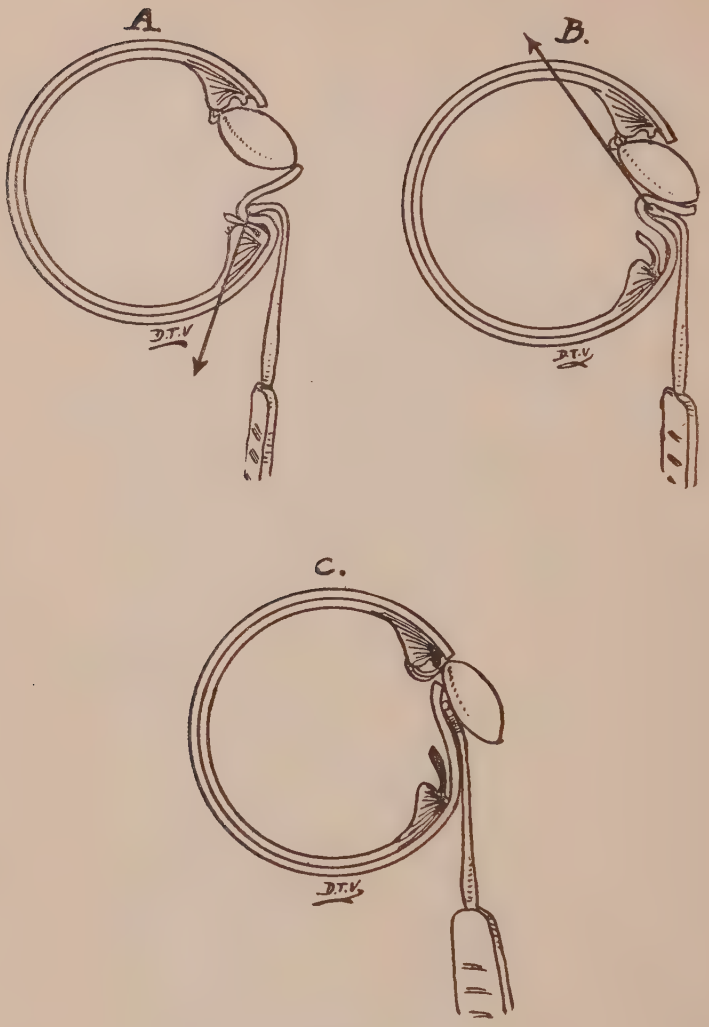


Fig. 22.

A—illustrating traction being made away from the wound in the case of version-delivery with the end of the hook engaged on the ciliary ridge. B—the cornea is now being tucked behind the lens which will in this case be delivered lower edge first. C—the cornea tucked "home" thus completing delivery of the lens by version. Note that the suspensory ligament is still attached above. The hook must now be removed from behind the lens and used to roll it away from its attachments as shown in Fig. 16.

ball and lying flat-wise, or as is more often the case, it may stand apparently only two-thirds of the way out and in a vertical direction. In either case the lens is to be regarded as being outside of the eye-ball as in each the corneal flap lies behind it. After the corneal flap has been engaged behind the lower (now the posterior) edge of the lens, the hook is lifted off the ball and its hollow elbow is used to draw the lens away from the wound and out of the eye (see Fig. 16). When the lens has ascended straight up from its bed and lies quite outside the eye-ball, the hook is naturally used in the right way to complete its deliverance from the region of the wound, but if it stands apparently only two-thirds of the way out and vertically to the wound, it will require some special instruction to know how to effect its entire delivery. In this case the hollow of the hook is placed to the left of the lens, the point of the hook directed obliquely upward away from the wound and the convex side of the elbow of the hook pressed toward the depth of the eye, thus pressing backward both the corneal and scleral sides of the wound. By this maneuver the wound is forced shut as both scleral and corneal lips are level and approximated. This secures the lens beyond peradventure and it is simply rolled out of its position and secured.

All that remains now to the operation is to disengage the iris entanglements from the wound and close and dress both eyes. Approximately seventy-five per cent of the smooth cases will be like the above description. In about twenty-five per cent of smooth cases the lens will turn and come out lower edge first.

Version Delivery: It is wrong to say that the lens turns over within the eye and is born with its posterior surface next to the inner surface of the cornea and the lower margin next to the wound. True I have seen this occur, but only in rare instances.

The behavior of "tumblers," as Col. Smith calls these cases, may be described as follows: The suspensory ligament first ruptures under the tip of the lens-hook and the hook descending more deeply toward the optical center of the eye-ball, causes the lower edge of the lens to present forward against the cornea and the upper edge to dip backward behind the scleral shelf of the wound. This, in fact, constitutes only a one-eighth turn of the lens and there it usually remains until the tip of the hook, which lies over the summit of the *corona ciliaris*, or what in plain English is

called the "ciliary ridge," is made to drag the eye downward toward the patient's feet; or in other words, until distinct traction is made away from the wound by means of the tip of the hook caught on the ciliary ridge. (Fig. 22A. Note the direction indicated by the arrow.) This tends to invite forward movement of the vitreous through the gap made by the ruptured zonule below the lens, which becomes the line of least resistance and the lower edge of the lens is thus forced upward. When the lens is turned one-fourth by these dynamic forces so that it lies at right angles to its normal position, the downward traction is abandoned and changed to the exact opposite direction (Fig. 22B); viz., *upward toward the incision* in order to tuck the cornea under the forward edge of the lens, and behind it in order to not only effect the birth of the lens, but also to head off the forward push of the vitreous. The lens is delivered outside the eye-ball by simply tucking the flap of the cornea behind it (Fig. 22C). The lens now hangs by a hinge-like attachment at its upper edge, which is the unruptured suspensory ligament above it. After the lens is outside the eye-ball and the cornea tucked home, it only remains to effect complete detachment and delivery by means of the hollow elbow of the hook used in the manner described. The idea involved in this "feet first" delivery of the lens is to get the cornea behind the lens. The gap which forms from rupture of the suspensory ligament below the lens furnishes an opportunity on the part of the eye for us to tuck the cornea behind the lens, which is best done in the manner just described, viz., traction away from the wound to widen the gap and under-tucking of the corneal flap by upward movement. Indeed the process has been likened by Birdwood, Greene and others to peeling a tight prepuce and exposing the glans penis in an infant.

The delivery by version is practically limited to nearly all cases of tumescent cataract and to many cases of Morgagnian (bag-like) cataract. If the incision is large, it affords the most satisfactory kind of delivery to encounter; but one must be careful in rolling the lens away from its final attachments after it is delivered, as the capsule is very fragile in the case of tumescent cataract and will not tolerate anything but the gentlest treatment without rupturing.

Combined Delivery: It now remains to describe what to do

in case the lens refuses to advance after the first pressure is applied. I shall pause first to say that as long as things are not at a standstill, you may fairly count on the result, but if for any reason things become "blocked" and no headway is made, you had better be careful and study your case. The cause of the "stand still" may be that the incision is too small. In this case it is plain

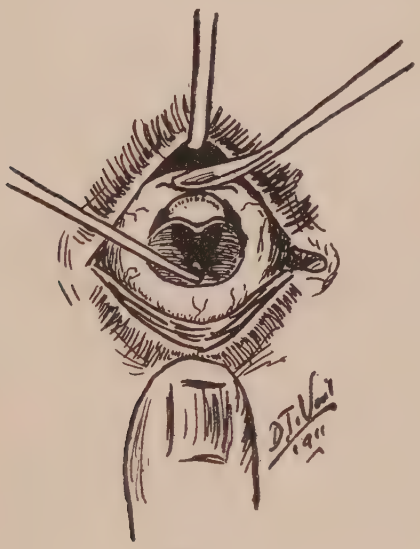


Fig. 23.

Illustrating combined pressure in case the lens does not glide upwards out of the wound, but the pressure with the spoon above must be lightly applied as vitreous may otherwise well up and not the lens.

that it should be enlarged with a pair of scissors. Or it may be that the lens has slid upward and the upper edge is caught behind the scleral shelf of the wound instead of presenting through the opening. This calls for a new start. Possibly the scleral lip of the wound should be gently depressed to enable the edge of the oncoming lens to ride forward and out of the wound (Fig. 23). Or, again, the suspensory ligament may be abnormally tough, as is the case with old cataracts (longer than two years' duration) in comparatively young adults (in fact, juvenile cataracts), in which before operating we note deep anterior chambers. In event of this stubborn resistance of the lens to move by the

employment of sane pressure, it is far better to introduce the spoon a short distance behind the lens and force the lens in its capsule on out (Fig. 24), pressing the lens hook against the lower part of the cornea and using the inserted paddle-like spoon as a back stop or inclined plane for the lens to ride out on rather than to plunge the hook deeper and deeper into the eye, using brute

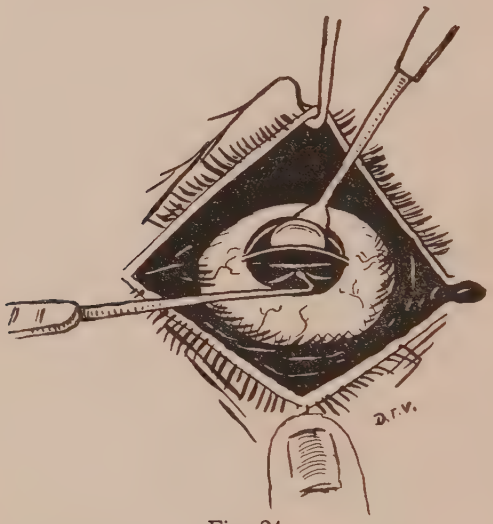


Fig. 24.

Illustrating the lens-spoon introduced a short distance behind the lens to afford a background for pressure thus taking the strain off the vitreous which has either "presented" or shown threatening signs of presenting.

force. I would rather give up the attempt at delivery in the capsule at this stage and in this event and resort to the capsulotomy operation, as Fisher described in his paper before the *American Academy of Ophthalmology and Oto-Laryngology,* at Cincinnati in 1910 (see *Transactions*), than to go doggedly on plunging deeper and deeper into an eye that has signaled by unmistakable signs that the lens cannot be delivered without dangerous pressure. In fact, this is what I do recommend in many cases and Fisher has my hearty endorsement on that point.

There are cases, however, in which it is still better to introduce the spoon boldly behind the lens and deliver in its capsule as described rather than to open the dense capsule and leave it, together with more or less lens substance, behind to result in a

dense after-cataract. Whether to do the capsulotomy operation at this stage or to use the spoon depends entirely upon the circumstances surrounding the case, viz., the kind of cataract present, the age and physical condition of the patient, etc.

Sometimes, and that too without fair warning, the vitreous

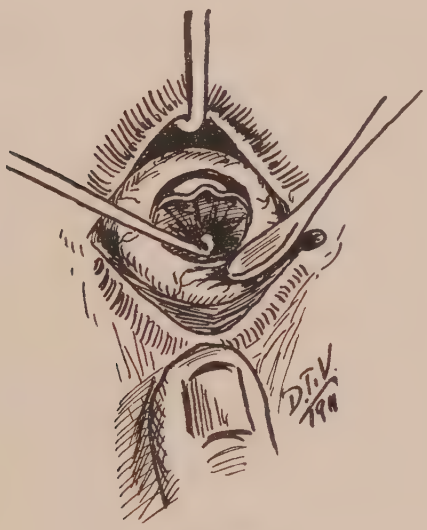


Fig. 25.

Illustrating how by increasing the tension of the vitreous with the added pressure of the spoon below the cornea a "stubborn" lens may be started from its bed and a successful and "dry" delivery effected. This added pressure is stopped as soon as the lens moves.

will suddenly present or begin to escape when everything up to this point is going on smoothly. There is no argument here regarding what to do. The proper and only course to pursue is to introduce the tip of the spoon behind the lens, or the entire paddle if need be, and force the lens out against it. The spoon acts as a trowel to hold the vitreous within the eye and at the same time affords a very satisfactory chute on which lens is made to glide in its escape from the eye. By the employment of this technic, very little if any vitreous need be lost.

The lens spoon is sometimes useful at the beginning of delivery in starting a stubborn lens if used as an additional pressure-

instrument below the cornea (Fig. 25). The pressure made in this event should be light and more like a slow "nudge" than anything else.

Combined delivery is required in from ten to twenty per cent of all cases.

Discussion by Richard J. Tivnen.

The two methods for the delivery or expression of the lens presented by the essayist, Dr. Vail, for our consideration this evening are known as, first, the "capsulotomy" method; second, the "intra-capsular" or "Smith" method of extraction. With the limited time at my disposal I am permitted to discuss only the second method—the "intra-capsular" or "Smith" method of extraction. This method of extraction has been for some time past *"sub judice,"* so to speak, and in no country has it attracted a more tolerant, just or friendly medical audience than in the United States. The period elapsed since its introduction in this country, while not extensive, has been nevertheless sufficient to develop a more or less crystallized opinion as to the merits of the procedure.

I have attempted to gather some authoritative information regarding the status in the United States of the "intracapsular, or Smith, method" of lens expression. To this end I addressed a series of questions dealing with the pertinent phases of the "Smith method" in particular, and including also some interesting features pertaining to the "capsulotomy method," to a limited number of ophthalmic surgeons throughout the United States. It was a matter of considerable regret to me that, owing to the brief period available for carrying out this investigation, I was unable to ascertain the valued opinion of all the ophthalmologists of this country.

The replies I received were most gratifying, both as to number and interest manifested. I avail myself of this opportunity of expressing my appreciation to those gentlemen who extended me not only the courtesy of a response to my questions, but who favored me in addition with a detailed and frank expression on the subject.

In presenting the results of these investigations it shall be my aim to maintain an impartial attitude. In consonance therefore with this decision I shall make no comments, adduce no conclusions nor present any personal opinion, but shall simply report

the answers I have received without modification or criticism. The answers to the questions may fairly be said to reflect the general opinion entertained by the ophthalmologists of the United States, on the subjects submitted.

Through the kindness of Dr. Greene, of Dayton, Ohio, who loaned me Colonel Smith's book on the *"Treatment of Cataract,"* I have been able to study Colonel Smith's views on the subject at first hand. By utilizing these two valuable sources of information, viz.: the answers received to my questions and Colonel Smith's views on the matter, I shall avoid the possible danger of assuming an *ex parte* character of presentation of the subject. I shall offer the subject, therefore, for your consideration in the following order: First, present the answers received to my questions; Second, introduce excerpts from Colonel Smith's book apropos to the especial features of the subject under discussion.

I.

ANSWERS RECEIVED TO THE QUESTIONS SUBMITTED.

The first question submitted was as follows:

"HAVE YOU PERFORMED THE 'SMITH' OPERATION OF EXTRACTING THE CATARACT IN CAPSULE, THE SO-CALLED 'INTRA-CAPSULAR' METHOD; IF SO, IN HOW MANY CASES?"

160 replies were received to this question.

Of the 160:—

111 (69.3 per cent) had not performed the "Smith" operation.

49 (30.6 per cent) had performed the "Smith" operation.

Of the 111 who replied that they *"had not performed the 'Smith' operation,"* each assigned at least one of the following reasons for not undertaking it:

"Capsulotomy method" safer.

Inferior because of large corneal incision.

Iridectomy and slower healing and the need of an experienced, skilled assistant.

More fraught with danger to vision; "old" method satisfac-

tory, therefore no cause to experiment with a more hazardous operation.

Difficult technique.

High refractive error.

Loss of vitreous.

Not sufficiently impressed with it to change from old method.

Not enthused with the method.

Dangers of operation too great.

Do not feel disposed to perform operation until I shall have some expert superintend a number of operations I perform.

Observation alone convinces me it is inferior.

Too much trauma.

Adhesion of posterior lens capsule to hyaloid.

Better wait ten years until we see how many retinal detachments result.

Danger of a wound of the eye-ball depends on its size—too large incision.

Can show microscopically that capsule is not intact in several so-called "Smith" operations.

Inferior for Americans on account of nervous patients.

Have studied and seen the "Smith" operation and my private opinion is that it is to be used only on an occasional case.

It is better if it were not more dangerous. For safety the old operation is better.

The supreme test is the visual result. I get better results than does Smith and with incision lying *all* in the clear cornea. Do not have loss of vitreous.

Still *sub judice*. Expect to try it one of these days. It's a case of "rock and whirlpool" anyway.

Only those with exceptional opportunities should undertake the operation.

My technique too imperfect.

Regard risks of "Smith" operation too great; namely, more danger of losing vitreous, more risky upon an intractable patient. Toilet of operation difficult to perform properly. When wound is gaping and vitreous protruding so that we are apt, under these circumstances, to have a very wide pupil resulting if not a prolapse and we incur the additional risk of infection.

Considering risk of prolapse of vitreous it does not appeal to me as wise.

Inferior by far to the simple extraction or the modified Graefe. "Smith's" method may be better on Hindoos but not on white men.

Have witnessed several "Smith" operations; all cases unsatisfactory from almost every standpoint.

Inferior because of larger corneal incision and iridectomy and slower healing and the need of an experienced skilled assistant.

Inferior, more trauma and traumatism of vitreous body.

Objections due to inexperience of operators in technique and selection of cases.

Too much trauma and not a safe operation for the ordinary operator who only has a few cases of cataract each year. For our patients the ordinary cataract extractions with "capsulotomy" is the safer method."

The second question submitted was as follows:

"BASED ON YOUR PRACTICAL EXPERIENCE, DO YOU REGARD THE 'SMITH' METHOD OF DEALING WITH THE LENS CAPSULE SUPERIOR OR INFERIOR TO THE USUAL 'CAPSULOTOMY METHOD'; PLEASE ENUMERATE THE POINTS OF SUPERIORITY; OR, YOUR OBJECTIONS."

Of the 49 who *"had performed the 'Smith' operation"*:—

18 (36.7 per cent) considered the method *"superior"* to the "capsulotomy method."

17 (34.6 per cent) considered it *"inferior"* to the "capsulotomy method."

14 (28.5 per cent) *"expressed no opinion."*

Note.—Many of the answers that are listed as *"superior"* were so stated with such qualifying phrases as: "Ideal in selected cases," "Much superior, of course, provided there is no loss of vitreous," "Superior only for immature and slowly progressive cataracts," etc. A number listed as *"inferior"* were so stated with such qualifying phrases as: "I attribute it to lack of trained assistants," "Except possibly in selected cases of hyper-mature cataracts," etc.

Of the 18 of the 49 who *"had performed the operation"* and who considered it *"superior"* to the usual "capsulotomy method" each gave at least one of the following reasons for considering it *"superior."*

Simplicity.

Less danger of infection.

Independent of co-operation of patient.
Quick recovery of eye.
Freedom from post-operative irritability.
No secondary needling required.
Better vision.
Ideal for immature cataracts.
Better in selected cases.
Effects of detritus to be absorbed are avoided.
Time is saved.
Gives clear pupil.
Complete absence of capsule.
Vision continues to improve and eye wears.
Secondary complications less numerous.
Iritis or irido-cyclitis less frequent.

Operation is done in one "seance" and the risks are therefore less than the "capsulotomy method."

Avoids all danger of secondary operations.

In immature cataract long delay causing distress, loss of time and money avoided.

The ideal operation.

Greatly decreased tendency to iritis where iritis is most probable by the old method.

The superiority of the "Smith" operation in the rapidity of recovery and degree of vision are very manifest, superior in the vast majority of cases.

Superior; simplicity, few instruments introduced in wound, less danger of infection, independent of co-operation of patient.

Superior by far if one can do the operation. First, vision continues to improve and eye wears; second, secondary cataracts less numerous; third, iritis and irido-cyclitis less frequent; fourth, immature cataract may be safely operated.

Superior, because it removes the capsule—the source of all secondary cataract; secures highest degree of vision by a single operation; avoids all danger incident to subsequent operations which must be done in a very large percentage of cases.

Superior in that it eliminates all possibility of secondary cataract.

Superior in two classes of cases; first, immature cataracts and, second, complicated cataracts or posterior synechia. Advantages: No secondary cataract where secondary cataract is especially dif-

ficult to deal with. Greatly reduced tendency to iritis where iritis is most probable by the old method. In immature cataract long delay causing distress, loss of time and money avoided.

Superior; (a) Ease of extraction when incision and technique are good. (b) Absence of after complications due to retained capsule and cortical substance.

Superior if it can be accomplished without loss of vitreous; quick recovery of eye; freedom from post-operative irritability; no secondary "needling" required; better vision; ideal for immature lenses.

Consider it of great value in selected cases.

Ideal in an immature cataract of long duration.

Of the 17 of the 49 who *"had performed the operation"* and considered it *"inferior"* to the "capsulotomy method" each gave at least one of the following reasons for considering the method *"inferior"*:

"Danger of loss of vitreous and bad reposition of iris.

Necessity of keeping aged patient flat upon back for a long period.

Greater difficulty of performance.

Better on Hindoos but not on white men.

Unsafe for average operator.

Corneal incision inferior as to safety compared with "old" method.

Bandage left undisturbed for ten days is unsurgical and positively dangerous.

More risky upon an intractable patient.

Toilet of operation difficult. When wound is gaping and vitreous protruding we are apt to have under these circumstances a very wide pupil resulting, if not a prolapse, and we incur an additional risk of infection.

Lack of trained assistants.

Limited field of usefulness.

Only those with exceptional opportunities should undertake operation.

Requires much more highly developed technique such as cannot be acquired by average surgeons.

Consider it to be more fraught with danger to vision than the method with "capsulotomy" or "capsulectomy."

Inferior, except possibly in selected cases of hypermature cataracts.

Unless in exceptionally skillful hands or where one has sufficient amount of this work to develop skill in doing the "Smith" operation, I think the "capsulotomy method" much safer.

Operation more prolonged and danger of loss of vitreous greater. With a nervous patient this is exaggerated.

More trauma and traumatism of vitreous body.

Method inferior for Americans on account of nervous patients. More liable to have escape of vitreous in "Smith" method.

Inferior because of larger corneal incision and iridectomy and slower healing and the need of an experienced, skilled assistant.

It is to be used only in an occasional case.

It is better if it were not more dangerous. For safety the old method is better.

Theoretically, I think only those with exceptional opportunities should undertake the operation."

The third question submitted was as follows:

"HAS THE 'SMITH' OPERATION, IN YOUR EXPERIENCE, SECURED EITHER AN INCREASED OR A MORE SATISFACTORY VISUAL ACUITY THAN THE USUAL 'CAPSULOTOMY METHOD'?"

Of the 49 who *"had performed the 'Smith' operation"*:—

15 (30.6 per cent) reported an *"increased and more satisfactory vision"* by the "Smith" method.

11 (22.4 per cent) reported *"inferior"* vision by the "Smith" method.

4 (8.1 per cent) reported vision *"equal by either method."*

19 (38.7 per cent) *"expressed no opinion."*

The fourth question submitted was as follows:

"IN THE EXPRESSION OF THE LENS DURING EITHER THE 'SMITH' OR 'CAPSULOTOMY OPERATION,' DO YOU THINK THERE IS MORE DANGER OF VITREOUS BEING LOST IF THE PATIENT 'LOOKS DOWN' DURING THE EXPRESSION, OR IF THE PATIENT LOOKS 'STRAIGHT AHEAD' OR 'SLIGHTLY UPWARD'?"

Of the 160 replies received:—

82 expressed *"no opinion."*

78 gave at least one of the following opinions:

NO METHOD SPECIFIED:

22 considered *"more danger"* of vitreous loss *"looking down."*

6 considered *"less danger"* of vitreous loss *"looking down."*

5 considered *"less danger"* of vitreous loss *"looking slightly down."*

6 considered *"more danger"* of vitreous loss *"looking strongly down."*

1 considered *"less danger"* of vitreous loss *"looking upward."*

3 considered *"less danger"* of vitreous loss *"looking slightly upward."*

4 considered *"less danger"* of vitreous loss *"looking straight ahead."*

2 considered *"more danger"* of vitreous loss *"looking straight ahead"* or *"slightly upward."*

2 considered *"less danger"* of vitreous loss *"looking straight ahead"* or *"slightly upward."*

CAPSULOTOMY METHOD:

1 considered *"less danger"* of vitreous loss *"looking down."*

1 considered *"less danger"* of vitreous loss *"looking slightly down."*

1 considered *"more danger"* of vitreous loss *"looking strongly down."*

1 considered *"less danger"* of vitreous loss *"looking straight ahead"* or *"slightly upward."*

"SMITH" METHOD:

1 considered *"more danger"* of vitreous loss *"looking down."*

1 considered *"less danger"* of vitreous loss *"looking upward."*

EITHER METHOD:

2 considered *"more danger"* of vitreous loss *"looking down."*

2 considered *"less danger"* of vitreous loss *"looking upward."*

1 considered *"less danger"* of vitreous loss *"looking straight ahead"* or *"slightly upward."*

POSITION NOT IMPORTANT:

6 considered position of eye not the important factor as affecting the loss of vitreous.

1 considered position not important but loss of vitreous due to pressure on the globe.

1 considered position not important but loss of vitreous due more to condition of vitreous (fluid vitreous).

1 considered position not important, loss of vitreous due to twitching or squeezing by nervous patient.

1 considered position not important, loss of vitreous due to spasm of the orbicularis.

2 considered position not important, loss of vitreous due to size of incision and pressure in delivering lens.

1 considered loss of vitreous dependent upon patient and skill of operator.

2 considered loss of vitreous due to adoption of "extreme positions" for the eye.

1 considered loss of vitreous due to muscular activity.

The fifth question submitted was as follows:

"IN THE 'CAPSULOTOMY METHOD OF EXTRACTION,' WHAT HAS BEEN YOUR EXPERIENCE AND OBSERVATION WITH THE REMAINING CAPSULE?

"(a) IN REGARD TO THE CAPSULE AND RETAINED CORTICAL MATERIAL CAUSING IRIDO-CYCLITIS?

"(b) DIFFICULTIES FOLLOWING 'NEEDLING' OF THE CAPSULE, SUCH AS INFECTION, IRITIS, IRIDO-CYCLITIS, ETC.?"

Of the 160 replies received (a) *"in regard to the capsule and retained cortical material causing irido-cyclitis":—*

65,-expressed *"no opinion."*

95,-gave at least one of the following opinions:

5,-believed irido-cyclitis to result in the following percentage of cases:

1,-in 10 per cent of cases;

1,-in 1 per cent of cases;

1,-in 25 per cent of cases;

1,-in 50 per cent of cases (slight);

1,-in 20 per cent of cases (some irritation).

6,-believed irido-cyclitis dependent upon amount of retained cortical material.

2,-reported "mild irritation."

2,-considered cortical material a source of danger.

5,-did not think iritis was caused by capsule or retained cortical material.

3,-reported irido-cyclitis rare.

16,-reported irido-cyclitis "uncommon."

9,-believed that remnants of cortical material do cause iritis.

5,-remove cortical material by irrigation and have no trouble.

3,-report that irido-cyclitis does not occur in "otherwise normal eyes"; when patient has rheumatism or gout or arterio-sclerosis it precipitates inflammation.

2,-report irido-cyclitis "very slight."

2,-report irido-cyclitis only in very immature cataracts.

19,-reported "no trouble."

4,-reported mild iritis.

3,-reported as common.

1,-believed cortex is a mechanical and possibly a chemical irritant.

1 believed that under 60 years, and if cataract is immature, remaining cortical matter is apt to produce an iritis.

5 reported "some trouble."

1 reported "not much trouble."

1 reported "trauma incident to forcible intra-capsular extractions may cause iritis or irido-cyclitis."

The character of some of the answers to question (*a*) *"In regard to the capsule and retained cortical material causing irido-cyclitis" in the "capsulotomy method"* are of value:

"Never can tell what it will do.

Depends upon amount left behind.

Irido-cyclitis not caused by capsule or cortex contained in capsule.

Is caused by cortex in anterior chamber.

Use irrigation freely to remove cortex and try to have capsule with shreds as little as possible which are likely to lie in the wound.

Question whether iritis is caused by remnants of retained capsule; in cases where most cortical material was left in, patients often did the best.

Retained capsule and cortex are frequently, almost invariably, provocative of post-operative iritis.

Retained cortex can be almost entirely removed by copious irrigation.

If general treatment (alterative) be combined with atropin and dionin locally, irido-cyclitis generally clears up nicely.

Am careful to free the margins of the incision from shreds of capsule, iris, etc.

Does not do it in "otherwise normal eyes."

Where patient has rheumatism, or gout, or arterio-sclerosis it precipitates inflammation.

Does not cause a predisposition to iritis.

Often have it and have blamed either the capsule, cortical substance or nurse.

Do not believe the retention of cortical material per se is particularly liable to induce iritic or cyclitic inflammation.

Believe the remaining cortex produces low-grade iritis, but not particularly harmful.

Each case a law unto itself.

Cortical material always a source of danger.

Under 60 years of age, if cataract is immature, the remaining cortical matter is apt to produce an iritis.

With a clean "capsulotomy operation" the lens capsule gives comparatively little trouble and early discission a good eye.

Discission is often disappointing, when lens substance has remained.

Who can say it is caused by cortical material?

Always find it.

Wait for mature cataract.

Is more or less of a menace.

Impossible of absorption in many cases and unquestionably may cause iritis.

Does not materially increase danger.

Only in very immature cataracts."

Of the 160 replies received to division (*b*) *"Difficulties following 'needling' of the capsule, such as infection, iritis, irido-cyclitis, etc.?"*

60,-expressed "no opinion."

100,-expressed one of the following opinions:—

4,-reported "infection."

8,-reported "iritis."

7,-reported "irido-cyclitis."

35,-reported "no trouble."

1,-reported having iritis, irido-cyclitis, infection and glaucoma.

2,-reported difficulty in maintaining opening in capsule.

1,-reported having had all, but infection.

1,-had all these complications, including ophthalmitis requiring enucleation.

1,-reported "good many troubles" following "needling."

1,-believed trouble to be due to too much trauma.

1,-always performed "needling" with some apprehension.

3,-use capsule forceps and seldom have to "needle."

11,-reported complications "rare."

3,-reported no complications in thin secondary cataract; in thick secondary cataract is dangerous.

1,-believes dangers are: (1) Glaucoma incited. (2) Iritis, irido-cyclitis. (3) Infection. (4) Failure to effect successful opening in axis of vision.

2,-reported difficulties do not occur when needle is entered through vascular limbus and used for cutting not tearing the capsule.

1,-believed no trouble would result if conjunctival sac be sterile.

1,-reported only difficulty to be, getting enough tear in capsule for visual purposes.

4,-reported no trouble since using "Ziegler method."

2,-reported secondary glaucoma.

10,-reported only a little trouble, but nothing serious.

The character of some of the replies received to the question regarding, "(*b*) *difficulties following 'needling' of the capsule, such as infection, iritis, irido-cyclitis, etc.,*" was as follows:

"Have done a 'needling' by Knapp's method or Ziegler's method in fully 60 per cent of my cases.

Occasion to needle the capsule in perhaps 80 per cent of the cases.

Since making it a practice to introduce the needle through the conjunctiva limbus, do not have complications following "needling."

Refuse to needle where vision equals 20/50ths.

Use Ziegler method of "needling" with excellent result as to vision, infection, iritis, etc.

Good many troubles following "needling."

Always wait six weeks after extraction and only use a needle for very gauzy membranes.

If membrane is at all tough or bears any evidence of inflammatory material upon it, I divide it with a very small Graefe knife or, making a free opening with a keratome, divide the membrane in each direction with a de Wecker scissors.

Have had some difficulty with a persistent, tough and thick capsule.

No difficulty especially when done with two needles.

By using capsule forceps I do less "needling" than when I simply lacerate the capsule or do not irrigate.

Little danger if not attended with too much traumatism.

In old cases with much exudate find that the opening is likely to close from further exudate.

Have had all of above and ophthalmitis necessitating enucleation.

Needling necessary in majority of cases.

No serious trouble except where "needling" is delayed a long time after extraction.

The capsule becomes tough and have had to "needle" twice.

Requires "needling" in 60 per cent of cases.

Iritis and irido-cyclitis follow operation only where capsular mass is thick and huge and the result of cortical matter remaining behind after the primary operation.

No difficulties providing the conjunctival sac be sterile.

No difficulties experienced; should not expect it if gentle and aseptic.

Major portion require "needling" unless preliminary iridectomy has been done.

If preliminary iridectomy has been done the capsule as well as the residuary particles is so much better accomplished that the necessity of secondary operation is very greatly diminished.

Trouble is due to the trauma following "needling"; that is "needling" or "knife needling" should only be used on diaphanous membrane.

Danger from operation is almost nil.

Iritis and irido-cyclitis are caused by the attempt to tear too tough a membrane.

Secondary glaucoma is my dread.

Use capsule forcep as routine practice and am sure that

removal of portion of capsule at time of operation is responsible for low percentage of cases requiring "needling."

No trouble if patient's general health is watched and local conditions kept under daily observation.

Nil if patient is properly prepared and operation carefully done.

Since using Ziegler method never necessary more than once.

Have had some irido-cyclitis, glaucoma, even panophthalmitis after "needling" and I wish that a safe method of removing the lens in capsule might be invented. "Smith" operation is to my mind far, very far, from being ideal.

If operation is done with the Ziegler knife and followed at once with local treatment without bandaging, the eye quiets down rapidly; especially if course of calomel is the routine general treatment.

Believe Callan is right in claiming irido-cyclitis is due to pulling on ciliary attachments, "dull knife."

Difficulties do not occur when needle is entered through vascular limbus and used for cutting—not tearing—the capsule.

No difficulties with interval of two to three weeks and eye quiet before operating.

II.

EXCERPTS FROM COLONEL SMITH'S BOOK ON "THE TREATMENT OF CATARACT."

In reading Smith's book on the *"Treatment of Cataract"* the first statement that attracts one's attention and compels his interest is that up to 1910 he had performed 24,000 cataract extractions by the "intra-capsular method." As Dr. Arnold Knapp has said, "this number is so enormous and so far in advance of any other operator's experience in this world that for this reason, if for no other, the book should be interesting and instructive to all ophthalmic surgeons."

TRAINING NECESSARY.—Colonel Smith gives his views on the training necessary for becoming a successful operator by the "intra-capsular method" in the following language: "I can no more understand a man being able to operate, as it should be

done, from a mere written description of this operation than I can understand a man proceeding to successfully play the violin, from a written description of the art, without practice and without teaching. The art must be learned by demonstration and by actual practice before a competent operator."

ADVANTAGES AND DISADVANTAGES OF THE OPERATION.—In comparing the relative advantages and disadvantages of the operation Colonel Smith writes: "Advocates of the 'capsulotomy operation' admit the occurrence of escape of vitreous in about five per cent of their cases. In my hands at the present time it occurs in a fraction over five per cent of my cases of extraction in the capsule done as a systematic operation without selection. * * * Escape of vitreous in the 'capsulotomy operation' is a more serious complication than in the 'intra-capsular operation.' In the 'intra-capsular' the whole of the offending body is removed; in the "capsulotomy' when vitreous escapes, the lens capsule is partially dislocated and is left behind with a considerable amount of lens matter, which causes iritis and irido-cyclitis. The 'intra-capsular operation' with escape of vitreous is devoid of this complication."

COMPLICATIONS.—With regard to complications, he writes: "Detachment of retina immediately following either operation is so rare an occurrence that it may be neglected in comparison of these two operations. Complex or late detachment of the retina follows the 'capsulotomy operation' more frequently than the 'intra-capsular' operation. * * * Detachment of the choroid occurs with about equal frequency in either operation in my experience. Iritis and irido-cyclitis occur with incomparably greater frequency after the 'capsulotomy' than after the 'intra-capsular' operation. I think I am not overstating the case by saying that one or both of these conditions follows in about ten per cent, of the cases, after the capsulotomy operation and is well under one per cent, after the intra-capsular."

VISUAL RESULTS.—As to visual results, Smith writes: "In the 'capsulotomy operation' without treatment of the after cataract, a high average would be six-twelfths,—at the end of three months, eight-eighteenths,—and at the end of six months, six-twenty-fourths, with suitable spectacles. * * * Such

vision is useless for fine work. After the after-cataract has been 'needled,' provided that it admits of being needled successfully, which is by no means always the case as in the cases I have mentioned previously, a vision of higher than six-ninths is very rarely attained. The average result in vision is nearly six-twelfths and often much less than this. Assuming the eye to be normal, apart from the cataract, at the time of operation by the 'intracapsular method,' a month after operation the vision should average six-sixths with suitable spectacles. * * * The ultimate vision is very much higher than this. Such vision is obviously sufficient for the finest of work, and puts the patient in as favorable a condition as regards sight as he was before operation."

AFTER-CATARACT.—His views on after-cataract are thus expressed: "To improve the vision after the 'capsulotomy operation,' it is necessary to operate on the after-cataract *invariably.* This introduces these patients to a second operation, which is not always satisfactory and which, as usually done, leaves the offending body in the eye. The capsule when left in the eye, whether 'needled' or not, is not an innocent body. It has no function in nature to perform when 'needle'—not even the questionable function of being a diaphragm. Nature often seems to resent its presence as indicated by the greater liability of such eyes to iritis or irido-cyclitis from trifling causes, which do not lead to such conditions in the normal eye or in the eye from which the lens and capsule have been removed."

DETAILED REPLIES TO QUESTIONS SUBMITTED.

Surgeon's Name and Address.	Have You Performed the "Smith" Operation of Extracting the Cataract in Capsule, the So-called "Intra-Capsular" Method?	Based on Your Practical Experience, Do You Regard the "Smith" Method of Dealing With the Lens Capsule Superior or Inferior to the Usual "Capsulotomy Method"?	Has the "Smith" Operation, in Your Experience, Secured Either an Increased or More Satisfactory Visual Acuity than the "Capsulotomy Method"?	During the Expression of the Lens (by Either Method) is There More Danger of Vitreous Being Lost if the Patient "Looks Down," "Straight Ahead" or "Slightly Upward"?	In the "Capsulotomy Method of Extraction," What Has Been Your Experience and Observation With the Remaining Capsule?	
					(a) In Regard to Capsule and Retained Cartical Material Causing Irido-Cyclitis.	(b) Difficulties Following "Needling" of the Capsule, Such as Infection, Iritis, Irido-Cyclitis, Etc.?
Adams, Alvyn L., Jacksonville, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Albro, M., Chicago, Ill.	One.	Probably better in selected cases. Heavy capsule or zonula contra-indicates; less danger of infection; better suited to the very old and contra-indicated in cases of attached iris.	Good vision seems more easily obtained.	Less danger "straight ahead" or "slightly upward."	Have had "irritation" but no irido-cyclitis.	Have had no infection, iritis or irido-cyclitis following "capsulotomy," but have had trouble in maintaining the opening in capsule.
Allen, Geo. F., Aurora, Ill.	No.	No answer.	No answer.	Prefer patient to "look down."	Sometimes considerable irritation, but never irido-cyclitis.	Never anything serious.
Alt, Adolph, St. Louis, Mo.	No.	What one should expect and what I hear from others, vision is better.	No answer.	Yes, I feel certain that "looking too far downward" aids prolapse of vitreous body in "capsulotomy" operation.	With a clean "capsulotomy" extraction the lens capsule gives comparatively little trouble and early discission a good eye. Yet when lens substance has remained behind discission is often disappointing in its results, although I have not had many instances of infection, or iritis, or irido-cyclitis, after it.	No answer.
Andrews, A. H., Chicago, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Ayres, S. C., Cincinnati, Ohio.	No. Satisfied with the Graefe's modified operation.	No answer.	No answer.	No answer.	No answer.	No answer.

Barr, W. A., Chicago, Ill.	Never performed.	No personal experience.	No answer.	No answer.	No answer.	No answer.
Bartholomew, A. C., South Bend, Ind.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Beard, Charles H., Chicago, Ill.	No; not intentionally.	No opinion.	No opinion.	Loss of vitreous does not result so much from the direction of the optic (or of the visual) axis as from external pressure upon the globe.	Think much cortical material left behind is certainly a source of irritation.	Do not fear complication when I use instrument and method I have adopted.
Beck, Jos. C., Chicago, Ill.	Five.	No opinion.	It has not.	"Looking down" more dangerous in "Smith" operation.	Very seldom.	Never saw any.
Black, Melville, Denver, Colo.	No. Do not feel disposed to perform operation until I shall have had some expert superintend a number of operations which I perform.	No answer.	No answer.	No answer.	No answer.	No answer.
Black, Nelson, Milwaukee, Wis.	I attempted three extractions after reading description of "Smith" operation but, after seeing Dr. Greene, of Dayton, O., operate, found out I had not been doing operation, in reality. The results were excellent in two eyes but only mediocre in third.	Ideal in an immature cataract of long duration.	No answer.	More danger upon "looking down."	Retained capsule and cortical substance is more or less of a menace—depends upon amount remaining.	Very little danger if the operative procedure is not attended with too much traumatism.
Boeckmann Sr., E. St. Paul, Minn.	A few times, without success.	Much superior, of course, provided there is no loss of vitreous.	Have often got the lens out with capsule during my forty years of practice and the eyesight is ever so much better.	I think so, but the cataract escapes also; easier "looking downward."	No answer.	Have seen iridocyclitis, glaucoma, even pan-ophthalmitis, after "needling" and I wish that a safe method of removing the lens in capsule might be invented. "Smith" operation is to my mind far, very far, from being ideal.

Bordley, Jr., James, Baltimore, Md.	Yes. Experience with "Smith" operation limited. My results with combined operations have been so satisfactory that I ventured little in this field.	No answer.	No answer.	No answer.	No answer.	No answer.
Bossiday, John C., Boston, Mass.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Brawley, Frank, Chicago, Ill.	No.	No answer.	No answer.	No answer.	Have had very little trouble with capsule remains and the frequent use of irrigator prevents retention of cortical material.	a "needling." Never had more than temporary pain and plus tension following
Broughton, Wm. R., New York City.	No.	The old operations being satisfactory I have no cause to experiment with what seems to me a more hazardous operation.	No answer.	Less danger when looking "straight ahead."	Never had a case of irido-cyclitis from cortical matter.	Never had trouble after "needling."
Brown, H., Chicago, Ill.	No.	No answer.	No answer.	"Slightly upward" position of ball conserves vitreous body best.	No answer.	The major portion require "needling" unless preliminary iridectomy is done (which I always endeavor to do). If preliminary iridectomy has been done the capsulotomy as well as the removal of residual particles is so much better accomplished that the necessity of secondary operation is very greatly diminished. Have had no "difficulties" following "needling."
Brown, J., Chicago, Ill.	No.	No personal experience.	No answer.	No answer.	Never saw irido-cyclitis follow extraction.	One case of needling followed by irido-cyclitis with hypopyon, which cleared up entirely after a few weeks.

Butler, W. K., Washington, D. C.	No.	Inferior. Operation more prolonged and danger of loss of vitreous greater. With a nervous patient this is exaggerated.	No experience with the "Smith."	More danger from "downward" rotation.	Very seldom results.	Very rarely under a careful antisepsis.
Calhoun, F. Phinizy, Atlanta, Ga.	No.	No answer.	No.	No answer.	No answer.	No answer.
Callan, Peter A., New York City.	No. (Dr. Greene operated on two of my patients with success.) In regard to the "Smith" operation we must not lose sight of the fact that Major Smith's patients are peasants, whose wants are few and mental demands not great, possibly not able to read or write. Further, Major Smith is in a class by himself—whose operations far outnumber those of any other surgeon living or dead. What he can do and does with impunity should not be attempted except under very favorable circumstances, in the general run of cases such as we have in the United States. I have no doubt but that a good operator under Smith's supervision would become expert in his method, still I do not consider it as safe as the usual operation with capsulotomy.	Too much trauma and not a safe operation for the ordinary operator who only has a few cases of cataract each year. For our patients the ordinary cataract extraction with capsulotomy is the safer method.	Not enough experience to be a good judge. Have only seen four "Smith's" all told; two of these done at Infirmary were unfortunate in the result.	"Looking down" greatly increases the danger of vitreous loss. The pressure on the globe is increased by looking down. Nystagmus almost stops when the patient looks down.	In my experience this is rare. Majority show proliferation of the anterior capsule.	The trouble following secondary cataract operations is due to the trauma following "needling," i. e., the needle or knife-needle should only be used on diaphanous membranes. The danger from operation is almost nil. Iritis and irido-cyclitis are caused by the attempt to tear too tough a membrane. As a rule the dangers following secondary cataract operations are due to the choice of many methods — too much trauma is exercised in securing an opening through the pulpillary membrane.
Carroll, James J., Baltimore, Md.	Never performed.	No answer.	No answer.	In "capsulotomy" operation prefer patient "looking straight ahead" or "slightly	The more cortical material the more irritation and the oftener irido-cyclitis.	Always perform a "needling" with some apprehension. Believe a destructive iritis or

				down." Barring unusual roughness in manipulation, think vitreous loss chiefly due to condition of vitreous (fluid vitreous) rather than upon position patient holds eye.		Irido-cyclitis often follows operation.
Clapp, C. A., Baltimore, Md.	No.	No answer.	No answer.	Have had loss of vitreous only in cases where there was a spasm of the orbicularis.	Cortical substances frequently cause iritis, seldom irido-cyclitis.	Infection, never had. Iritis — if capsule is very tough. No. irido-cyclitis.
Clark, C. F., Columbus, Ohio.	Have had considerable experience with the "Smith" method of extracting cataract and consider it of great value in selected cases.	No answer.	No answer.	No answer.	No answer.	No answer.
Cohen, Lee, Baltimore, Md.	No.	No answer.	No answer.	I direct patient to "look downward" and at same time lift weight of speculum from eye. Have experienced vitreous prolapse in only one instance and this was in an unruly patient.	Have had only one such complication, mentioned above (maniacal and tore bandage off of eyes).	Obliged to "needle" capsule in 20 per cent of cases. Have had no iritis or infection. Particular about method of "needling;" if capsule is tough, prefer De Wecker iris scissors to knife-needle.
Coleman, W. F., Chicago, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Conkey, C. D., Superior, Wis.	No.	No answer.	No answer.	Yes. The danger is greater in "looking down."	No answer.	No answer.
Coover, D. H., Denver, Colo.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Croker, F. S., Chicago, Ill.	No.	No answer.	No answer.	"Slightly down" best.	No irido-cyclitis.	No "difficulties."
Darling, C. J., Chicago, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Davis, A. E., New York City.	No.	No answer.	No answer.	No answer.	No answer.	No answer.

Derby, G. S., Boston, Mass.	No.	No answer.	No answer.	Yes.	With retained cortical, irido-cyclitis is more frequent.	Seldom have to do "needling" since using capsule forcep. Seldom have "difficulties" after needling.
Dixon, George Sloan, New York City.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Duane, Alexander, New York City.	No.	No answer.	No answer.	No answer.	Have had no cases of infection or iritis from retention of capsule. My observation of Dr. Herman Knapp's numerous cases led me to feel that such accidents are a great rarity when "capsulotomy" and "needling" are done by a skilled and careful operator.	No answer.
Dufour, C. R., Washington, D. C.	I have not.	No answer.	No answer.	No answer.	No answer.	No answer.
Ellett, E. C., Memphis, Tenn.	No.	No answer.	No answer.	No answer.	By using capsule forceps I get good results combined with irrigation. It seems to me that there is very little reaction due to capsular and cortical debris.	I do less "needlings" than when I simply lacerate the capsule or do not irrigate.
Ellis, H. Bert, Los Angeles, Cal.	One.	No answer.	No answer.	No answer.	Only two or three cases out of 200 operations.	One case of iritis following "needling."
Elwood, C. R., Menominee, Mich.	No.	No experience.	No answer.	I always have patient "look down."	No answer.	I use capsule forceps of Meller and follow his technique. Have had no "difficulties" following "needling."
Eringer, W. R., Rockford, Ill.	No.	No answer.	No answer.	No answer.	Not surprised at severe iritis or irido-cyclitis when considerable cortical material is left behind, but do not always get it.	Had no "difficulties" following "needling."

Faith, Thomas, Chicago, Ill.	Three cases.	Superior if it can be accomplished without loss of vitreous; quick recovery of eye. Freedom from post-operative irritability, no secondary needling required; better vision; ideal for immature lenses.	Better—based on personal cases and observations of Dr. Greene's cases.	More danger "looking down." Should never be allowed after extraction manipulations have begun.	Iritis and post-operative irritability extremely common; never can tell what it will do.	No trouble following "needling" of capsule.
Farrell, P. J. H., Chicago, Ill.	Yes. Number unknown.	Yes. The failures are so common and general with the "capsulotomy method," that I hesitate.	Yes.	Immaterial—as to position. Danger is twitching or squeezing by a nervous patient.	No answer.	No answer.
Fisher, William A., Chicago, Ill.	Twelve.	How can 12 operations object to 30,000 performed by Smith?	Not enough experience to answer.	More danger in "looking down."	Often have it and have blamed either the capsule, cortical matter or nurse.	Nothing to it.
Fox, L. Webster, Philadelphia, Pa.	Yes. Am not doing "Smith's" operation except in very rare	No answer.	No answer.	No answer.	No answer.	No answer.
Fridenberg, Percy, New York City.	No. cases.	There is no doubt in my mind that "Smith's" operation, when successful and complete without complications, disposes of the capsule more effectually than any "capsulotomy" operation.	No answer.	Having the patient "look up" adds greatly to the safety of any cataract operation.	Retained lens masses often cause iritis.	No answer.
Gamble, W. E., Chicago, Ill.	No.	Inferior; more trauma and traumatism of vitreous body.	No answer.	More danger in "looking down."	Does in some cases, especially where disturbance in metabolism or tendency to iritis from other causes.	Complications exceedingly rare. In normal cases practically negligible.
Gardner, E. J., Chicago, Ill.	No.	No answer.	No answer.	No.	Wait for mature cataract, very little trouble with cortex and capsule.	Use Knapp's needle and method. Seldom have complications.

Gradle, H. S., Chicago, Ill.	Not personally. But assisted E. Elsching in about 65 cases.	Surgically considered "Smith" operation is ideal. Practically, it offers many serious objections, chief among these being the incision and the adhesion of the posterior lens capsule to the hyaloid membrane. Let us wait and see how many retinal detachments result after ten years' experience.	No.	Believe the danger in "looking down" to consist in the liability of sudden movement of the patient. This is obviated by "looking ahead."	I do not believe that the capsule and cortical matter remaining behind could cause a dangerous cyclitis.	Have never seen "difficulties" following "needling" provided the conjunctival sac be sterile.
Greene, Jr., John St. Louis, Mo.	I have never performed the "Smith" operation.	No answer.	No answer.	No answer.	No answer.	No answer.
Grosvenor, Lorenzo N., Chicago, Ill.	No.	I can show microscopically that the capsule is not intact in several so-called "Smith" operations.	No answer.	No answer.	No answer.	No answer.
Hallock, Silas E. New York City.	No.	No answer	No answer.	Think there is more danger if the patient "looks down." Prefer the "straight ahead" position.	Capsule and retained cortical matter does not materially increase danger.	Have had no serious results following "needling."
Hansell, Howard F., Philadelphia, Pa.	Have not operated according to the Indian method and I don't believe I ever shall.	No answer.	No answer.	No answer.	Retained cortex unquestionably may cause iritis. It is impossible of absorption in many cases.	None.
Harlan. Herbert, Baltimore, Md.	Ten or twelve times.	Inferior chiefly on account of great difficulty of performance.	Increased visual acuity.	More danger if patient "looks down" in both operations.	Very little, if any.	Good many troubles following "needling."
Hawley, C. W., Chicago, Ill.	No.	No answer.	Dr. Greene operated on two for me but the visual results were no better than the old way.	Having lost vitreous but once in twenty years can not give a good opinion as to this.	Never had any such result.	Never had any such result.
Higgins, Samuel. Milwaukee, Wis.	No.	Objections due to inexperience of operators in technique and selection of cases.	Bad results seen in others' practice offset better vision in successful extraction by the same operators.	No answer.	The vital point, as I see it, is whether or not this "Smith" operation offers a safe method of extraction	No answer.

					before the cataract becomes ripe.	
Hollister, M. C., Chicago, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Hoffman, J. R., Chicago, Ill.	Yes. Three cases; attempted in three others; abandoned for usual method because of faulty incision or technique.	Superior: (a) Ease of extraction when incision and technique are good. (b) Absence of after-complications due to retained capsule and cortical matter. No objections. I believe in the "intracapsular" method.	Experience too limited; but believe results of visual acuity must be better after "Smith" operation.	More danger "looking down." I believe for most safety to patient and convenience to operator "straight ahead" is best position.	I believe retained capsule and cortical material are often responsible for uveal complications.	"Needling" is sometimes followed by uveal complications.
Holmes, C. R., Cincinnati, Ohio.	No; have not been sufficiently impressed with it to change from old method.	No answer.	No answer.	No answer.	No answer.	No answer.
Howe, Lucien, Buffalo, N. Y.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Huizinga, J. G., Grand Rapids, Mich.	Twelve.	Convinced that in my hands at least the "Smith" Indian method has a limited field of usefulness.	Yes, where no complications were present after operation.	I have neved had any serious loss of vitreous in any case.	The presence of lens debris tends to incite inflammatory reaction resulting in adhesion between the anterior and posterior capsules with consequent opacities and cicatrices.	Never had infection. Iritis or irido-cyclitis present in about 15 per cent of such cases.
Jackson, Edward, Denver, Colo.	No.	Inferior, because of larger corneal incision and iridectomy and slower healing and the need of an experienced, skilled assistant.	No.	Danger is increased by "looking strongly down."	Irido-cyclitis is not caused by capsule or cortex contained in the capsule. Is caused by cortex in anterior chamber.	Such "difficulties" do not occur when needle is entered through the vascular limbus and used for cutting, not tearing, the capsule.
Jones, Monroe,	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Kettlestrings, F. W., Oak Park, Ill.	One case.	Am not enthused with the method.	Have secured vision for the diamond type by the old method and feel sure no operation can beat it.	Greater liability of vitreous being lost on "looking down," because wound has more tendency to gape.	Irido-cyclitis has occurred but those cases have been subjects of rheumatism; lenses extracted clean.	Have had no inflammations following "needling."

King, Clarence, Cincinnati, Ohio.	206 cases (performed on Indian cases).	My experience shows the "Smith" operation beyond doubt superior in two classes of cases. (1) Immature cataracts and (2) complicated cataract with posterior synechia. Advantages: No secondary cataract where secondary cataract is especially difficult to deal with. Greatly decreased tendency to iritis where iritis is most probable by the old method. In immature cataract long delay causing distress, loss of time and money avoided. Evidence on hand tends to show "Smith" operation superior to the "capsulotomy" in the majority of cataracts. Believe that further experience under conditions of our civilization and closer scrutiny of results by both methods is necessary before this can be held to be demonstrated.	Increased visual acuity secured by the "Smith" method.	More danger when patient "looks down"—chiefly due to the pressure of lower lid. "Smith" technique of expression hardly possible when patient "looks down."	No answer.	My experience shows discission to be practically uncomplicated in thin secondary where conditions are otherwise favorable. Consider discission in thick secondary cataract or those with posterior synechia to be fraught with danger.
Kiper, George F., LaFayette, Ind.	Accidentally in three.	All these cases did well with nice black pupils and good vision, corrected.	No answer.	The above lost no vitreous.	A few cases have shown irrido-cyclitis.	No trouble in "needling" afterwards.
Knapp, Arnold, New York City.	Yes.	It seems to me that the two methods of cataract extraction can be compared as follows: That on the side of the "capsulotomy" operation can be placed greater simplicity, and less vitreous prolapse (this	No answer.	No answer.	No answer.	No answer.

		cannot be denied, vitreous is practically never lost in the ordinary operation in the hands of a skillful surgeon); on the side of extraction in capsule, less reaction (iritis) and no secondary cataract with its complications. Furthermore, the operation is much more difficult than the ordinary one and I think it is to be deprecated that throughout the country many eye-doctors without sufficient practice or training are attempting to do this operation.				
Lamb, Robert Scott, Washington, D. C.	Four with records; others, no records now tangible.	No, but I attribute it to lack of trained assistants. Small amount of material (relatively). Type and position of incision.	Vision quite satisfactory but no better. Earlier fitting of glasses is possible.	More danger if patient "looks down." Least when patient looks "slightly upward."	Does not do it in "otherwise normal" eyes. Where patient has rheumatism or gout or arteriosclerosis it precipitates inflammation.	No trouble with "needling" if patient's general health is watched and local condition kept under daily observation.
Lambert, Walter Eyre, New York City.	No. Think I never shall. I have come back to combined extractions; in fact, prefer to make a preliminary iridectomy whenever possible.	No answer.	No answer.	No answer.	No answer.	No answer.
La Mothe, E., Chicago, Ill.	No.	"Intra-capsular" method in very special cases; example, soft cataracts. Objections, difficulties of the technique and in the event of mishap the error is almost irreparable. "Capsulotomy" method safer.	No opinion.	"Looking slightly down" helps the extraction; as soon as lens is engaged through pupil, then best to "look straight ahead."	Never knew cortical material cause iridocyclitis. (In personal and observation of over 1,000 extractions.)	Never had or observed any complications.

Lapsley, R. M., Keokuk, Iowa.	No.	No answer.	No answer.	Not if patient only looks "slightly down."	Have had several cases of irido-cyclitis but none very severe and was not sure of cause.	No "difficulties" experienced.
Lebenshon, N. H., Chicago, Ill.	No.	No answer.	No answer.	The size of the incision and pressure in delivering lens are more important than the direction in which the patient looks. I have patient "look down."	Have observed it in very few cases.	"Needling" is necessary in majority of cases. Have had no serious trouble except where "needling" is delayed a long time after extraction; the capsule becomes tough and have had to needle twice.
Lesage, C. A., Dixon, Ill.	No.	No answer.	No answer.	In "capsulotomy" operation we have patient "look straight ahead" during the expression of the lens. Which is best position can not say.	Never had iridocyclitis following retained capsule and cortical material.	We make use of the Ziegler method of "needling" the capsule with excellent results as to vision, infection, iritis, etc.
Lester, John C., New York City.	No.	Have witnessed several "Smith" operations—all cases unsatisfactory from almost every standpoint.	The contrary.	Depends on skill of operator and patient. Prefer patient to "look down."	No answer.	Nil if patient is properly prepared and operation carefully done.
Lewis, E. R., Dubuque, Iowa.	Two.	Superior, in that deleterious effects of detritus to be absorbed are avoided, time is saved, secondary procedures rendered unnecessary. Inferior, in that successful end results are more at the mercy of the behavior of patient during operation.	No difference.	More danger if patient "looks down."	Have seen cases where retained detritus caused irritation and anterior uveitis.	Iritis and irido-cyclitis have occurred in my experience.
Mancaster, S. B., Washington, D. C.	No.	Method inferior for Americans on account of nervous patients. More liable to have escape of vitreous in "Smith" method. No answer.	No answer.	Less vitreous loss if patient looks "slightly downward."	Very little.	Not much.

Mann, W. A., Chicago, Ill.	No answer.		No answer.	No answer.	No answer.	No answer.
May, James W., Kansas City, Kans.	No; have never performed it.	No answer.	No answer.	No answer.	No answer.	No answer.
May, Charles H., New York City.	No.	No answer.	No answer.	No answer.	Use small bulb, glass-tipped irrigator and remove cortical material by irrigation. Am careful to free margins of the incision from shreds of capsule, iris, etc. Have had cases of irido-cyclitis following extraction but not frequently.	Never had serious complications of "needling" after cataract; in no case has there been infection, iritis, irido-cyclitis or glaucoma.
Marple, William B., New York City.	No. Am perfectly satisfied with the results of the "capsulotomy" method.	No answer.	No answer.	No answer.	Never have seen such a case.	Have never had any such "difficulties."
McConachie, A. D., Baltimore, Md.	One.	No opinion; theoretically should be superior, giving an entirely clear field, but preliminary risks are very much greater from loss of vitreous.	No opinion; my case gave 20/30; no better than numerous other cases by older methods.	Having the patient look almost "straight ahead" or very "slightly down" does away with much tension; assures the greatest safety to both.	Never had a case of irido-cyclitis from retained capsule which did not prove amenable to atropin.	Have had no iritis, irido-cyclitis or infection since using Ziegler method of discision. Infection, it seems to me, is needless with careful asepsis.
Meierhof, Edward L., New York City.	No.	No answer.	No answer.	Have not noticed any difference.	No answer.	No answer.
Mittendorf, Wm. F., New York City.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Montgomery, W. T., Chicago, Ill.	No.	Am sure old method is easier and safer for me.	No answer.	More danger of vitreous loss if patient "looks down." Prefer patient to look "straight ahead."	Rarely irido-cyclitis from retained cortical material.	Have had to "needle" in perhaps 20 per cent of cases. Seldom any reaction and never inflammations.
Nance, Willis O., Chicago, Ill.	Nine cases.	Theoretically ideal. Complete absence of capsule, lens substance or debris from anterior chamber is obviated. Objections—corneal incision in	In personal experience (nine cases) vision secured not encouraging and below that usually secured with "capsulotomy" method.	Am aware that it is the general opinion that loss of vitreous is more common when patient "looks down." I know no positive reason for this opinion.	In a certain percentage of my cases there remains in the anterior chamber some capsule and cortical material. It is seldom I have an irido-	Never had a case of infection, iritis or irido-cyclitis following a "needling" operation.

		"Smith" inferior as to safety compared with "old" method. More trauma. Bandage left undisturbed for ten days is unsurgical and positively dangerous.		I prefer the patient to "look down." Do not believe my percentage of vitreous losses is any greater than those operators who instruct patient to "look upward" or "straight ahead."	cyclitis following an extraction. I do not believe that retention of cortical material, per se, is particularly liable to induce iritic or cyclitic inflammation. Always endeavor to make anterior chamber as free of lens substance or debris as I possibly can.	
Noble, W. L., Chicago, Ill.	No. Don't intend to so long as I can give 20/30 vision in cataract extraction by old way.	Considering risk of prolapse of vitreous it does not appeal to me as wise. If you have ever learned how to extract with the posterior capsule intact.	No.	The more extreme position you put the eye in the more the danger.	I separate with needle and don't leave cortical material in chamber.	If you use good judgment, very little trouble.
Parker, Frank J., New York City.	Four cases.	Inferior by far to the simple extraction or the modified Graefe. "Smith's" method may be better on Hindoos but not on white men.	No.	Less vitreous lost with patient "looking upward."	Had no difficulty with irido-cyclitis.	Had no difficulty in removing by scissors or needle. Had two cases irido-cyclitis following "needling."
Payne, D. A., Chicago, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Peterman, H. E., Baltimore, Md.	No.	Unless in exceptionally skilful hands or where one has sufficient amount of this work to develop skill in doing the "Smith" operation I think the "capsulotomy" method much the safer.	No.	Possibly slightly more if patient "looks up" or "down" to considerable extent.	Had rather severe irido-cyclitis in three or four cases out of last 100 extractions. In all but one good vision resulted. In these cases I think remaining cortical material and capsule had much to do in causing irido-cyclitis. Have had similar conditions present following extraction but no irido-cyclitis developed. In all these cases, however, there was more tendency to iritis.	Have had only one bad result from "needling," a severe irido-cyclitis which caused the loss of the eye.

Pfingst, Adolph O., Louisville, Ky	No. Have seen operation performed eight times by man doing much of this work; seems to me the end result will be loss of more eyes (function) than by old method.	No answer.	No answer.	No answer.	No answer.	No answer.
Posey, W. Campbell, Philadelphia, Pa.	No, nor shall I as I consider the dangers of the operation too great.	No answer.	No answer.	No answer.	No answer.	No answer.
Pratt, J. A., Aurora, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Prince, A. E., Springfield, Ill.	No experience.	No experience. Anticipate it will be a decided advance.	No experience.	More danger if patient "looks extremely downward." Have lost vitreous so seldom that I do not regard this as a serious complication.	Do not have iridocyclitis as a result of the retained cortex very often.	Have occasion to "needle" the capsule in perhaps 80 per cent of the cases. Since making it a practice to introduce the needle through the conjunctiva at the limbus do not have complications following "needling." Before adopting this method I regarded needling as a very serious operation, as it occasionally entailed infection at the point of introduction of the needle in the cornea.
Pryor, James C., Washington, D. C.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Reber, Wendell, Philadelphia, Pa.	Six cases.	"Smith" operation requires much more highly developed technique, such as cannot be acquired by the average ophthalmic surgeon. "Capsulotomy" method much easier, surer, and safer, hence more productive of average good results in spite of its disadvantages.	No.	"Looking upward" slightly best position for delivery of lens, in all cataract operations.	Retained capsule and cortex are frequently, almost invariably, provocative of postoperative iritis. Retained cortex can be almost entirely removed by copious irrigation. If general treatment (alterative) be combined with atropin and dionin locally, irido-cyclitis	"Needlings" of the remaining capsule and even iridotomies are frequently necessary after the "capsulotomy method;" but a "V"-shaped capsulotomy or iridotomy with a Ziegler knife is easily done and if followed at once with local treatment without bandaging, eye quiets down

					generally clears up nicely.	rapidly especially if a course of calomel is the routine general treatment.
Remmen, N., Chicago, Ill.	No.	The danger of a wound of the eyeball depends much on its size. If you have to amputate the eyeball in order to get out the lens the danger is greater than if you can get the lens out through a small opening.	I never got better than six-sixths.	No answer.	Sometimes occurs but who can say it is caused by cortical material in some cases?	Very rarely occurs.
Roberts, W. H., Pasadena, Cal.	No.	No answer.	No answer.	No answer.	Have never had irido-cyclitis.	No infections but some iritis. Consider "needling" a secondary more than a minor operation and one calling for careful technique and judgment.
Robertson, Charles M., Chicago, Ill.	Yes.	Superior; no secondary cataract.	Yes, in some cases although old method in some hands is hard to beat.	Don't know.	Never had trouble from irido-cyclitis.	No "difficulties" experienced; should not expect it if gentle and aseptic.
Rogers, F. T., Providence, R. I.	No.	No answer.	I have seen two cases by other operators and resulting vision was below average.	No answer.	No answer.	I have had three cases of irido-cyclitis following "capsulotomy" and four of glaucoma in something over 500 extractions, and I do a secondary capsulotomy in, approximately, 40 per cent of my cases.
Roy, Dunbar, Atlanta, Ga.	Two.	Is superior as far as the capsule is concerned but more dangerous in the final outcome.	No.	No material difference in my opinion.	Am firmly convinced that remnants of cortical matter do cause a predisposition to iritis.	No complications.
Ryan, L. R., Galesburg, Ill.	One. Did not often attempt, because our patients are generally more nervous and trained assistants are few.	Superior in that it eliminates all possibility of secondary cataract.	No answer. (My case had 20/20 vision; astigmatism 1 D.)	No answer.	Have had a few cases of iritis due to retained cortex.	Never had to "needle" more than 10 per cent of cases; never had iritis or irido-cyclitis following.

Satterlee, Richard W., Buffalo, N. Y.	No.	Inferior, more danger of losing vitreous.	No.	Prefer patient to "look straight ahead" or "slightly upward" in ordinary extraction.	Each case a law unto itself. Possibly 20 per cent have some irritation from retained cortical substance.	Very rarely infection; have seen some iritis in 30 to 35 per cent following "needling."
Sattler, Robert, Cincinnati, Ohio.	No answer.	No answer.	No answer.	Operator must control absolutely position and movement of the globe through the pressure indentations of the globe with the hook. In other words, he renders and keeps the globe immovable through the firm pressure and exerts directly backwards. Only at first or before this pressure has begun, which at the same time fixes the globe to effect the delivery of the lens, can the patient aid the operator; after it is once in operation it is an unfortunate mistake to exert the patient to "look up," "down" or "straight ahead" for I believe that the patient is absolutely passive and the will and intuition of the operator alone rules.	No answer.	No answer.
Savage, G. C., Nashville, Tenn.	Have not done the "Smith" operation for cataract and am sure I never will perform it. Have done something like fifty extractions after my own method and am sure it is easier, safer and better than the "Smith" operation. My method is almost as easy as the "capsulotomy" method,	Observation alone convinces me that the "capsulotomy" method is superior to the "Smith" operation.	Have had no observations in this direction. It would be ideal to have the capsule out of the way.	"Looking down" is dangerous in any extraction.	Not very much danger.	Secondary glaucoma is my dread though it has not occurred often. Twice an unaccountable fluffy collection has formed in the aqueous chamber, almost filling it. Once this disappeared, leaving good eye; once the eye was visionless although the material, whatever it was, disappeared.

	which cannot be said of the Smith operation. I believe the Hulen operation is superior to mine, though I have not resorted to the use of the vacuum method of detaching the lens as yet.					
Schneider, C. F., Elgin, Ill.	No.	Don't know.	No opinion.	Makes no difference.	Do not know.	No answer.
Schramm, George V., Salt Lake City, Utah.	No.	No experience.	No answer.	Always have patient "look down" and have never lost any vitreous.	Have had irido-cyclitis due to retained cortical substances. Some quite severe; slight in probably 50 per cent of all cases.	Have had to "needle" in 50 per cent of cases I believe, and have more or less irido-cyclitis in all cases but no infection.
de Schweinitz, Geo., Philadelphia, Pa.	Three or four times.	Personal experience too small to give satisfactory answer.	Experience too small. My visual results from the usual operations are very good.	Naturally, I think the "Smith" technique should be strictly followed. "Looking up" saves vitreous expulsion.	Unusual experience. Retained cortex and capsule caught in the wound may cause iritis, etc.	My results have been uniformly good; only two primarily bad results which ultimately turned out very well, I think. Have done a "needling," usually Knapp's method or Ziegler method, in fully 60 per cent of my cases.
Selby, Emily H., Chicago, Ill.	No.	No answer.	No.	"Slightly upward."	No answer.	No answer.
Shannon, John R., New York City.	No.	No answer.	No answer.	No answer.	Cannot recall having had this result in any case.	Have had no case of infection; comparatively few of iritis and none of the more serious after effects.
Small, Charles P., Chicago, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Smith, J. Whitfield, Bloomington, Ill.	No.	No answer.	No answer.	I usually have my patients "look gently downward."	No answer.	Have had some "difficulty" with a persistent, tough and thick capsule.
Starkey, Horace M., Rockford, Ill.	No.	No answer.	No answer.	No answer.	Have not observed iridocyclitis that seemed to be caused	Have had no severe "difficulties" following "needling" but find

					through the presence of retained cortical material; may have contributed in a very few cases.	in old cases with much exudate that the opening is likely to close from further exudate.
Stevens, Henry B., Boston, Mass.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Stevenson, Mark D., Akron, Ohio.	Eighteen.	I don't know. Lost my last case by suppuration. Been doing old operation since.	About the same.	Prefer patient "looking straight ahead."	If much cortical material is left, is more likely to cause iridocyclitis. Use irrigation freely to remove cortex and try to have capsule with shreds as little as possible which are likely to lie in wound.	Rarely "difficulties" after "needling," sometimes slight iridocyclitis.
Stricker, Louis, Cincinnati, Ohio.	Eight times. Have personally had one case of infection follow ten days after a successful "Smith" operation, but this was due to poor nursing—the wound being opened on the 10th day by a clumsy nurse. Infection followed and eye was lost. But this should not be counted against the "Smith" operation as the same result would have been obtained had a "capsulotomy" been done.	Superior. Because it removes the capsule—the source of all secondary cataracts; secures highest degree of vision by a single operation; avoids all danger incident to subsequent operations which must be done in a very large per cent of cases.	Certainly as good and in many cases an increased visual acuity.	Greatest danger in "looking down."	Undoubtedly secondary cataract follows "capsulotomy." Personally, never had iridocyclitis.	Have seen iridocyclitis follow "needling." Have never seen infection follow needling.
Swan, C. J., Chicago, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Szymanski, Julius, Chicago, Ill.	One—Personal. Ten—Observation.	Superior; simplicity, few instruments introduced in wound, less danger of infection, independence of cooperation of patient.	Indifferently.	More danger "looking down."	No observations.	No observations.

Tenney, John A., Boston, Mass.	No.	No answer.	No answer.	I do not know. The loss of a little vitreous does not trouble me much, though, of course, I would prefer that it should not happen.	I question whether iritis is caused by remnants of retained capsule; in cases where the most cortical material was left in eye patients often did best.	Never had a mishap from "needling."
Thompson, Edgar S., New York City.	A few.	My cases have all done well, though there has been more reaction than with the other procedure. Think there is no question that this reaction is dependent on the technical skill and experience of the operator, as undoubtedly a high degree of technical skill is required for the delivery of the lens by this method.	No answer.	No answer.	Have not had severe reaction from cortical material for some years past. When I have considerable cortical material to be absorbed, I apply iced cloths very early and give mercury internally, or whatever remedy may be indicated by the constitutional tendencies of the patient.	Have very little difficulty with "needlings." Always wait six weeks after extraction, and only use a needle for very gauzy membranes. If the membrane is at all tough or bears any evidence of inflammatory material upon it I divide it with a very small Graefe knife, or making a free opening with a keratome, divide the membrane in each direction with a de Wecker scissors.
Timberman, Andrew, Columbus, Ohio.	207 cases in India. I do not want as yet to report on the limited number done since returning from Amritsar.	Superior by far if one can do the operation. 1. Vision continues to improve and eye wears. 2. Secondary complications less numerous. 3. Iritis or irido-cyclitis less frequent. 4. Immature cataract may be safely operated.	Both increased and more satisfactory.	More when "looking down."	I am always afraid of it — irido-cyclitis and distortion of pupil.	I have had all of above and ophthalmitis necessitating enucleation.
Tingley, Louisa P., Boston, Mass.	No.	Inferior.	No.	More danger in patient "looking upward" or "straight ahead."	In 100 cases by "capsulotomy extraction" have had only two cases of irido-cyclitis; the two occurred in patients who disregard orders for after-treatment.	Had no "difficulties."

Tivnen, Richard J., Chicago, Ill.	Once, accidentally; in a patient where the combined "capsulotomy method" had been planned.	No opinion.	No opinion.	More danger of vitreous being lost if patient "looks strongly downward."	Never had irido-cyclitis.	Never had infection, iritis or irido-cyclitis following "needling."
Todd, Frank C., Minneapolis, Minn.	Four.	Prefer "capsulotomy" method as a routine procedure. Regard risks of "Smith" operation too great, viz., more danger of losing vitreous, more risky upon an intractable patient, toilet of operation difficult to perform properly when wound is gaping and vitreous protruding so that we are apt, under these circumstances, to have a very wide pupil resulting, if not a prolapse, and we incur the additional risk of infection.	No.	More danger "straight ahead" or "slightly upward."	Sometimes causes irido-cyclitis.	Usually no "difficulties." In primary operation, aim to prevent necessity of "needling." Attempt removal of as much capsule as possible. Use capsule forceps as routine practice and am sure that removal of portion of capsule at time of operation is responsible for low percentage of cases requiring "needling."
Tyson, Henry H., New York City.	Three.	From my very limited experience and observation I regard the "Smith" method inferior to "capsulotomy" method, except possibly in selected cases of hyper-mature cataracts.	No.	Do not think direction of eye has much, if any, influence on vitreous loss. I generally have the eyes "look down." The location of section and direction of pressure I consider exert the greatest influence on loss of vitreous.	Very fortunate in having about only one per cent.	Never had infection; had few cases of mild iritis; no irido-cyclitis; no glaucoma.
Vail, D. T., Cincinnati, Ohio.	Over 400 cases.	Superior in the vast majority of cases.	In ideal cases we get 20/20 vision in either. The "Smith" operation is done at one seance and the risks are therefore less than the "capsulotomy" method. Yes, increased and more satisfactory vision is obtained.	More danger in "looking down" especially if lower lid is not controlled throughout and after delivery.	25 per cent (estimated) have this complication.	First danger, glaucoma incited. Second danger, iritis and irido-cyclitis. Third danger, infection. Fourth danger, failure to effect successful opening in the axis of vision.

Valk, Francis, New York City.	Yes. Not intentionally, but have removed lens in old people in same way.	Inferior.	No answer.	Do not see the advantage of any position.	Have not found it so.	No "difficulties." My cases seldom need a secondary operation—possibly 30 per cent or less.
Verhoeff, F. H., Boston, Mass.	Six cases.	My technique was too imperfect for me to draw any conclusions in this regard but I never do the operation now.	After my apparently most satisfactory "Smith" operation, in which there was no loss of vitreous, separation of the retina occurred about three months after operation.	No answer.	Irido-cyclitis only in very immature cataracts.	Have had only one untoward result following "needling." This was a purulent iritis with hypopon which, however, finally cleared up with vision 20/20. Never had glaucoma although I do an unusually free "needling."
Vinsonhaler, Frank, Little Rock, Ark.	Have performed it, accidentally, about six times.	Regard "Smith" method as unsafe for average operator.	No answer.	More danger after expression in patient "looking down;" have often noticed vitreous recede and wound close by patient "looking up."	Have found cortical material always a source of danger. Had one cystoid cicatrix after extraction, caused by a tag of capsule healing in corneal wound. The eye had to be enucleated subsequently. Now always pass iris forceps along incision for capsule tags.	Have never had a purulent infection after a "needling," have had after extraction, in about 360 cases of extractions possibly followed by between 90 and 100 "needlings;" have had iritis and irido-cyclitis.
Voight, C. B., Mattoon, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Von der Heydt, Robt., Chicago, Ill.	No.	No answer.	No answer.	No answer.	No trouble except in one case. Capsule incarcerated in wound cauterized — O. K. — Mild cyclitis.	No "difficulties." "Needlings" should not follow operation or preceding needling (if a second one is necessary) too soon. Interval of four weeks — meaning two or three weeks of quiesence for eye.
Waite, Frank L., Hartford, Conn.	No.	No answer.	No answer.	No answer.	No answer.	No answer.

Walker, H. L., Cedar Rapids, Iowa.	No.	Know only by observation and argument, high refractive errors and loss of vitreous, also difficult technique.	No experience. I think not, from observation and hearsay.	No experience.	Very few cases of after irritation.	"Needling" often necessary. Very few after-needling troubles. "Needling" not most satisfactory in result.
Walter, William, Chicago, Ill.	No. (Had Dr. Greene do two cases for me.)	No answer.	No answer.	No answer.	No answer.	No answer.
Weeks, John E., New York City.	No.	Have not adopted "Smith" method because, after careful study, I consider it to be more fraught with danger to vision than the method with "capsulotomy" or "capsulectomy."	No experience with "Smith" operation. I obtain 20/20 in at least 66 per cent of private patients by "capsulotomy" operation.	In expressing the lens after "capsulotomy" the patient should look about 15 degrees below horizontal plane of eyes. More apt to lose vitreous on strong rotation downward; escape of lens obstructed on strong rotation upward.	Iritis or irido-cyclitis extremely rare.	One case of slight infection in 15 years (probably 300 needlings.)
Weidner, C ., Hartford, Conn.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
Weiner, Meyer, St. Louis, Mo.	Fifty-three cases.	"Smith" method superior in selected cases, example, with loose zonule (iridodonesis) and good vitreous as evidenced by normal tension. Also in cataract where both eyes affected, immature and very slow developing. When vitreous is lost floating bodies result which take long time to absorb.	No.	Much less danger if patient looks "straight ahead" or "slightly upward."	Believe remaining cortex produces a low-grade iritis, but not particularly harmful.	About 8 per cent must be "needled." No serious effects from "needling" and since using Ziegler method never necessary more than once.
Wells, David W., Boston, Mass.	No.	No answer.	No answer.	No opinion.	Mild iritis after leaving in considerable soft cortex.	No infection; irido-cyclitis in old cases, only one in which I had done the extraction. High myopia with congenital cataracts which became opaque at age of twelve.

Wilder, William H., Chicago, Ill.	Eight cases (not enough to form conclusions from).	Naturally if the extraction is intra-capsular there is no capsule to cause trouble. I should think the intra-capsular method particularly suited to unripe or over-ripe forms of cataract. Certainly I should think that the aggregate amount of injury done to the eye by an ordinary extraction of a ripe catract plus the after discission of the remaining capsule would not equal the trauma incident to an intra-capsular operation.	It has not.	I have not had enough experience to judge.	If much cortical substance is left in the eye it may or may not cause increased reaction with iritis or irido-cyclitis. The trauma to the eye incident to the forcible intra-capsular extraction may also cause iritis or irido-cyclitis.	I have not encountered much "difficulty" following "needling" of the capsule, especially when done with two needles.
Wilkinson, Oscar, Washington, D. C.	Have never had the courage to undertake the "Smith" operation. Consider "Smith" operation too difficult to perform except by those with very large experience and then after special training.	No answer.	No answer.	No answer.	Never had it occur.	Never had any serious sequel after "needling."
Woods, Hiram, Baltimore, Md.	One. (Accidentally; over-ripe lens which turned and came out in capsule.)	Theoretically, I think only those with exceptional opportunities should undertake the operation.	My case had 20/20.	No answer.	Capsular cataract in not over one-third of my cases. Always fear it (irido-cyclitis), but have seldom seen it. Usually circumcorneal injection until all cortical amtter is absorbed.	Have had only one case of infection after "needling;" have seen several cases irido-cyclitis. Believe Calan is right in claiming this is due to pulling on ciliary attachments, "dull knife."
Woodruff, Harry, Joliet, Ill.	One.	Can not answer.	Can not answer.	Safest when there is no muscular activity and no pressure.	No answer.	Never had any serious complication.
Woodruff, Thomas A., Chicago, Ill.	No.	No answer.	No answer.	No answer.	No answer.	No answer.

Worrell, J. P., Terre Haute, Ind.	Two.	The superiority of the "Smith" operation in the rapidity of recovery and degree of vision are very manifest.	Yes.	No opinion. Follow "Smith's" suggestion permitting patient to follow his own will.	Have not had much trouble.	"Difficulties" rare.
Worthington, M. H., Chicago, Ill.	No.	No answer.	No answer.	No difference whether patient "looks down or up."	No difficulties.	No such complications, if time enough has elapsed before operation.
Wurdemann, H. V., Seattle, Wash.	In 51 cases.	Superior only for immature and slowly progressive cataracts. Suitable for about 25 per cent of cases of cataract.	Yes.	Yes; on "looking down;" for incision have patient look "straight ahead" and during expression always "upward;" in the "capsulotomy operation" always "straight ahead" except if vitreous be lost, then always "upward."	10 per cent.	No infection following "needling" in my experience; perhaps 5 per cent iritis in post-extraction cases; perhaps 50 per cent iritis in pure discission cases; cannot recall any cases or irido-cyclitis following discission of capsule in 1,496 operations (cataract) perhaps 400 "needlings."
Wyler, Jesse S., Cincinnati, Ohio.	Six cases.	The intra-capsular operation leaves, of course, a black pupil at the start but it is decidedly more dangerous, not only because of loss of vitreous and bad reposition of the iris but necessity of keeping aged patients flat upon their backs for a long period. The future of the "Smith" in my opinion, and I have assisted Vail and Greene many times, is for immature cataracts which can't wait for ripening.	The perfect "Smith" gives a better acuity but the average does not surpass my results in the "capsulotomy" method as I always use a capsule forcep and take away entire anterior wall.	More danger of escape of vitreous when patient "looks down."	No answer.	Have never had any infection or irritation after cataract or after "needling" and in observing and assisting in series of 242 "capsulotomy operations" (simple and combined) in Fuchs' clinic several years ago, in which no untoward result followed; am perfectly satisfied with these results.
Young, H. B., Burlington, Iowa.	No.	Still sub-judice. Expect to try it one of these days. It's a case of "rock and whirlpool" anyway.	No answer.	In "capsulotomy method" I direct a "slightly downward" movement and have not regretted it.	Lavage for cortical matter is my routine practice. The unincarcerated clean capsule I do not fear.	Excepting that I have never had infection I have had, like the others, uveitis, glaucoma and refuse to needle

						where vision equals 20/50.
Zentmayer, William, Philadelphia, Pa.	No.	No practical experience.	No answer.	slightly upward." Least danger "looking	Under 60 years of age, and if cataract is immature, the remaining cortical matter is apt to produce an iritis.	Required operative treatment in at least 60 per cent of cases. Iritis or irido-cyclitis follow the operation only where capsular mass is thick and huge as the result of cortical matter remaining behind after primary operation. Had infection after capsule in only one case.
No signature.	Have never performed it.	No answer.	No answer.	No answer.	No answer.	No answer.
No signature.	No.	No answer.	No answer.	The more "downward" the eye is turned the more the danger of vitreous loss increases.	Have never had a case of irido-cyclitis following extraction.	Have never had infection. iritis or irido-cyclitis follow "needling" operation. The only trouble I have experienced was in getting through or producing enough tear in the capsule, to get area enough for visual purposes.
No signature.	No.	No answer.	No answer.	No answer.	Have had some trouble of this kind which terminated fairly satisfactory.	In cutting capsular cataract bands have had irido-cyclitis, fortunately terminating O. K.
No signature.	No.	I have studied and seen the "Smith" operation and my private opinion is that it is to be used only in an occasional case. In the regular run of cases, if used, the surgeon should be held strictly responsible for results if he does the "Smith" operation.	No answer.	I have my patients "look straight ahead."	I have had practically no trouble with remaining capsule.	Have had no trouble after "needling."

No signature.	One case only in which lens was extracted in capsule and that was an accident, owing to a tough capsule. Case did well.	No answer.	No answer.	No answer.	No answer.	No answer.
No signature.	No. I do not advise it and would not have it done on my eye if I had cataract.	No answer.	No answer.	No answer.	No answer.	No answer.
No signature.	Do not use it.	No answer.	No answer.	In "capsulotomy operation" I always have patient "look down."	Have had a mild iritis in few cases where there was large amount of cortical matter.	Never had infection, iritis or irido-cyclitis following "needling" of capsule.
No signature.	Only a few, not more than five, but have had some done for me by Dr. Greene.	It is better if it were not more dangerous. For safety the old method is better.	No.	There is danger if "looking far down."	If much lens material left there is danger of it.	Very little trouble unless capsule is extremely dense and result of previous inflammation.
No signature.	No.	No answer.	No answer.	No answer.	No answer.	No answer.
No signature.	Twice, years ago.	Old method better, because safer. The supreme test is the visual result. I get better results than does "Smith" and with incision lying all in the clear cornea. Do not have loss of vitreous.	No.	More dangerous if he "looks down."	Never had irido-cyclitis and I wash out detritus. Never use manipulation.	Have never had more than passing irritation from "needling." Experience limited—150 cases.
No signature.	No.	No answer.	No answer.	Not in the old operation.	I believe cortex is a mechanical and possibly a chemical irritant.	I have had glaucoma follow "needling" once, but never infection and do not dread the operation if iridectomy has been done.
No signature.	No.	I have had no experience with it.	Don't know.	I have not noticed any great difference.	Very slight.	I have seen only one bad case of infection following "needling;" ordinarily no greater amount of infection.

CHAPTER VI.

THE TOILET

By Chas H. Beard, M. D., Chicago.

The ultimate object of the toilet after operations for the extraction of cataract is to obtain prompt and uncomplicated recovery. The immediate objects to be attained are:

First. The removal of any cortical matter that may have been left behind.

Second. The reposition of the iris.

Third. The cleansing of the incision.

Fourth. The coaptation of the lips of the incision.

Fifth. The cleansing and irrigation of the conjunctival sac.

The degree of thoroughness with which these several steps of the toilet are carried out will depend as much upon the behavior of the patient as upon the skill and conscience of the operator.

There are two classes of subjects with whom a complete toilet is often impossible, viz., the over-agitated and the irresponsible. Of the two the former is to be preferred. The great danger from both is that of squeezing the globe, thereby causing expulsion of its contents by opening of the incision or inversion of the corneal flap. If the patient is utterly demoralized or intractable it were better not to attempt any but the absolutely imperative phases of the toilet. We encounter those in whom docility is so lacking that even any attempt at a toilet is more to be dreaded than the immediate dressing of the eye.

Other modifying conditions are incident to the *character* or *method* of the *extraction,* and to the *kind* of cataract. A coloboma of the iris, as after preliminary or preparatory iridectomy, or the extrusion of the iris, as in simple extraction, favors or simplifies the first step of the toilet, viz., that of the removal of cortex. A sclerosed or a hyper-mature cataract obviates the necessity of this step. So also does extraction of the lens in its capsule.

Supposing the case in point is one in which the various steps above mentioned are called for and feasible, how proceed? Shall the blepharostat or the retractor be removed and a few moments' time be allowed for the aqueous to accumulate, or shall the instrument be left in position and the pause be omitted? Be it remembered the patient is a tranquil and a docile one. I prefer leaving the blepharostat, if it is of a trustworthy kind, and going ahead without a break. I would, however, make one exception; this would be in the event of corneal collapse. Here expulsion of the cortex is not practicable without at least a partial restoration of the anterior chamber. The fewer times the aqueous is drawn off during the operation the better. I also prefer to proceed unaided whenever possible for the actual steps of the toilet, rather than rely upon untrained or unfamiliar assistants. The great safeguard against squeezing is firm, even forcible, holding up of the brow. This the operator himself may do, and would better do, though it hampers somewhat his hand, if a competent aid be not present. If the speculum seems to rest rather heavily upon the globe, the assistant may hold that up, too.

When there is a conjunctival flap it is kept turned down over the cornea until after the lips of the corneal section are put in apposition.

Making use of the lids as the medium for "milking" out the cortex is, I believe, largely a thing of the past. The rubber clad finger, applied directly to the globe, for this purpose, as recommended by Czermak, is much less to be deprecated.

1. The Removal of Cortex.

Next to the section the expulsion of the secondary masses that remain after the delivery of the nucleus of the cataract is, perhaps, the most important step of the extraction. In many instances the two forward chambers may be freed of cortex by external manipulation with the spoons; that is, by depressing the posterior lip of the incision with the edge of one, and gently stroking the cornea in an upward direction with the back of the other. If any of the lens remains prove refractory to these maneuvers, it is time to introduce the spatula for its inverted shoehorn effect, to make of it a chute, as it were, working without with the smaller rounded spoon, and taking care not to injure the delicate membrane of Descemet with the extremity of the

spatula. As fixation of the globe is best dispensed with during this step one must be on guard lest a sudden upward roll of the eye may cause the spatula to puncture the posterior capsule, or the zonule.

Posterior cortex will sometimes resist both external and internal manipulation to such an extent that it is expedient to abandon further efforts at its removal. It may even be obdurate to intra-ocular irrigation. If the iris is intact and in place, as after simple extraction, the spatula may be used to push that membrane backward, and the extremity of the instrument be directed backward, through the pupil, in order that the cortex in the posterior chamber can be made to slide up the blade and out at the incision.

With regard to intra-ocular irrigation, or *lavage,* there seems to be a singular, theoretical unanimity of sentiment in its favor "as applied to certain selected cases," and as singular a disregard of it in practice. That it is effective in ridding the eye of cortical remains there can be no doubt, but that, in the vast majority of instances, it is an act of supererogation, if not positively inadvisable, is no less certain. If lavage is resorted to the simpler the irrigator the better. Rubber tubing and rubber bulbs are objectionable because of the loose particles of rubber or other detritus they are apt to contain. My preference would be for an all-glass syringe, barrel, piston and nozzle. Such an instrument may be readily rendered perfectly sterile, can be used without assistance, and the force of the injection can be regulated with great precision. Moreover, the small quantity of liquid it would contain is preferable to the large quantity usually thrown into the eye from the large automatic irrigators. It is not always necessary to pass the tips of the irrigator *through* the incision, in order to wash out the cortex, but often suffices to merely depress the posterior lip and allow only the *stream* to enter the eye. Repeated introductions of any instrument are to be discouraged, and when one *is* re-entered, as the spatula, for example, it should, each time, be previously flirted in an antiseptic solution.

Some operators, Valude among them, advise the aspiration of cortical matter by means of a Redard aspirator. First those portions in the anterior chamber are sucked up, then, without withdrawing the nozzle, it is passed into the posterior chamber, and behind the iris, taking care to avoid its suction effect upon that

membrane. To me this would seem a more rational procedure then lavage for routine practice. It might be especially applicable to retention of cortex in the posterior chamber by a contracted pupil in simple extraction.

2. The Reposition of the Iris.

If the iris extrudes from the wound, as is often the case in the simple extraction, it is best to leave it till the cortex is disposed of. It will usually tend to return to its place spontaneously —in many instances really before one wishes it to do so. This tendency constitutes a valid objection to the custom of waiting for the anterior chamber to reform before attempting to remove the lens remains, as these latter are prone then to take refuge behind the iris in the upper part of the posterior chamber, where they resist all efforts to bring them out. The pupil, meanwhile, has become very small, thus effectually shutting off the cortex.

If the prolapse persists after the cortex has been disposed of, it becomes necessary to replace it. To this end we first avail ourselves of the natural tendency of the iris to return to place. By gently patting the cornea and the sclera in the vicinity of the incision, either with the spoons or with the spatula, and by jets of warm boric acid solution directed upon it from the dropper, we encourage contraction of the sphincter. Or one may have recourse to the very ingenious expedient devised by the late Dr. Knapp of applying the back of the spoon to the globe below the cornea and making a quick pressure movement toward the center of the globe so as to cause the wound to gape and let go of the iris.

Bearing in mind the extreme delicacy that characterizes the structure of the iris we refrain as much as possible from touching it with the instruments. An extensive prolapse may be often reduced by manipulations that absolutely respect the membrane itself. However, should it remain obstinate to these milder measures, one must resort to contact with the spatula. This should be after such a manner as to inflict the minimum of traumatism. The spatula is placed on the posterior lip of the incision to slightly depress it, and with its edge parallel with the direction of the wound, and the iris is returned to the anterior chamber by a sort of rotary, slicing movement. It is only when portions of the iris are held so tightly in the angles of the incision as to resist external

manipulation that one is justified in dislodging them with the spatula; and then this is accomplished by poking them back into the chamber with the rounded end of the instrument.

Now and then a hernia of the iris is so rebellious that it were better to abscise it than to reduce it, all bruised and torn, to its original position. This is most apt to be the case when vitreous is presenting, and on the verge of prolapse.

While working to replace the iris one is, at the same time, performing a similar office as regards shreds of capsule, which if left in the wound would prevent healing and invite infection. The last movements of the spatula should be *repository,* as opposed to the first ones which are preferably *evacuant.*

If a proper toilet is impractical one should at least strive to give the wound and conjunctival sac a parting irrigation.

3. The Cleansing of the Incision.

Shreds of capsule, particles of cortex and iris pigment, and strings of fibrinated blood, should any of them be left in the wound, may prevent primary union and vitiate the result. As before stated, shreds of capsule that are fast within the eye, and whose free ends get into the incision, are dealt with by the same *repository movements* of the spatula that are employed to replace the iris. All the loose particles, be they of pigment, cortex or capsule, are treated by the *evacuant* movements. That is, the tip of the spatula is passed the whole length of the incision, back and forth, from one angle to the other, with a sort of sweeping-out movement, but only with a single insertion, and refraining from a decided entrance of the tip into the anterior chamber.

4. The Coaptation of the Lips of the Incision.

This includes also the arranging of the conjunctival flap when present. There are instances when the edges of the wound incline to gape or to over-ride. Gaping may be due to external pressure, as of the blepharostat or of the retractor, and only disappears with the removal of the instrument. Overlapping is most likely to occur in those incisions at the very base of the cornea where the posterior lip is thick and firm while the anterior is thin and flaccid. They may be put even by means of the spatula or spoon, by pushing and patting, or it may be necessary to remove the speculum and massage the parts through the upper lid. After seeing to it that the apposition is correct the conjunctival flap, if

any, is put in place by means of the toilet forceps, or spatula, and smoothed down by stroking it toward its free extremity. A backward fold may be straightened out by passing the spatula beneath the flap and toward the free end.

5. The Cleansing and Irrigation of the Conjunctival Sac.

If there has been the least bleeding, clots will have formed. They cling mainly to the wound, to the edge of the conjunctival cuts, and to the borders of the lid. They are best removed with the aid of the delicate toilet forceps of De Wecker. This instrument has curved members, and the jaws are not toothed, but are slightly roughened. Some surgeons also use it to replace and properly arrange or spread out the iris (Müller). After picking off the clots the whole conjunctival sac, including, of course, the field of operation, is copiously flooded with warm boric acid or normal salt solution. This serves not only to wash away all loose matter but favors both the straightening out of the iris, and the coaptation of the incision. This irrigation is directed in such a manner as not to disturb the conjunctival flap; while this usually remains undisturbed, it is important to note that such is the case.

The eye is now ready for final closure. If the blepharostat is still in place it is grasped by the handles, slightly lifted from the eye, the patient is told to close the eyes, and the handles, while being pressed together, are tilted forward and pressed firmly downward, freeing the upper lid, and the lower lid-holder is then lifted out of its cul-de-sac. If this instrument has been already removed the operator takes the tips of the upper lashes between thumb and index and lifts the lid over the wound while drawing it down into place.

The instillation of a myotic after the extraction is superfluous, or actually harmful.

Discussion by E. J. Gardiner.

Dr. Beard has so thoroughly covered the ground in his paper that little remains to be said on the subject.

Like in the days that followed the publication of Von Graefe's articles on the modified linear section, we are now passing through a process of upheaval in the technique for the extraction of cataract. But all the methods advocated, excepting perhaps the "Indian" operation, leave the eye in much the same condition for

the last step, therefore the safest and best way to make the toilet is of paramount importance.

The great and fundamental principle in making the toilet is to remove the cortical masses from the anterior chamber, with as little manipulation as possible, and without introducing instruments therein. Whatever technique the experienced operator has found, that based on these fundamental principles, and accomplishes the result in a satisfactory manner, is the proper technique for that particular operator. I make this statement because I believe that there is in operating, as there is in writing, an individual style, and that when a successful operator tries to adopt another man's methods, brilliant as the results may be, in the other man's hands, he is in great danger of losing some part of his individual technique that made for success. We are not all especially versatile.

Dr. Beard says "A sclerosed or a hyper-mature cataract obviates this step" (the toilet). I would like to add that a mature cataract immensely simplifies the step, therefore I would make a plea for less haste in operating on senile cataract. Act in haste and repent at leisure is true of more than one activity in life. It is true that waiting for thorough maturity entails some inconvenience for the patient, but the difficulties in operating are so much lessened, and the chances for a brilliant result are so much increased, that in the ordinary run of cases the waiting course is much to be commended.

"Making use of the eyelids as a medium for milking out the cortex is I believe a thing of the past." If by "milking" Dr. Beard means, and I take it he does, squeezing the eyeball alternately with the upper and the lower eyelids, I concur in his opinion; but if he means the use of the lower lid as a medium with which to exert pressure on the eyeball, I differ from him. The soft, smooth eyelid is an excellent medium with which to transmit the pressure from a dexterous thumb. The objection sometimes made that there might be infection from bacteria retained in the Meibomian ducts, is, I believe, more theoretical than practical; nevertheless, it is advisable to express the contents from these ducts when the patient is being prepared for operation.

There is one warning in the paper that I would like to see more strongly emphasized, viz., the danger of repeated trials to remove posterior cortex. It sometimes happens, especially in im-

mature cataracts, that posterior cortex will resist every known method of manipulation, and an early recognition of this fact, with the abandonment of further efforts for its removal, may save an eye from total destruction.

Too much cannot be said regarding the importance of thoroughly cleansing the lips of the wound from shreds of iris and capsule. All the loose particles should be carefully removed by gently stroking the cornea with the eyelid or with the spatula, adherent shreds should be dealt with by the repository movements of the spatula so well described in Dr. Beard's excellent paper.

[All surgeons are agreed that the fewer the number of steps to an operation the less the danger of complications. Simple extraction may be done in every case of mature, uncomplicated cataract in persons under sixty. It is rightly called "simple" as only three steps are necessary, the incision, the capsulotomy and the expression. As a rule very little toilet is necessary.—*Ed.*]

CHAPTER VII

COMPLICATIONS AND AFTER-TREATMENT.

D. W. Greene, M. D., Dayton, Ohio.

Beginning with the preparation of the patient, there is no step in a cataract operation which may not cause complications, and require after-treatment.

The importance of a careful study of complications in cataract operating is emphasized by the fact that there are very few post-operative diseases or conditions which have not been credited to them.

Selected cataract cases, operated by first-class operators, will furnish about eighty-five per cent. first-class results, measured by the visual standard laid down by Knapp[1] of 20/200 to 20/20 as a first-class result.

Unfortunately, complications will occur even in the most skillful hands, and these are responsible for the fifteen per cent. of losses or indifferent results admitted above. In unselected cases, complications are more frequent and add at least five per cent. more to the indifferent results of the first-class. This gives eighty per cent. of successes and twenty per cent. of indifferent results divided as follows:—Moderate results, fifteen per cent., Failures, five per cent.

The so-called moderate results, with vision equal to 18/200 to 1/200, have little value, as the vision secured in probably half of them is not sufficient to be of much benefit to a patient.

These visual statistics, based on a large experience in cataract operating, are not quite so good as those given by Knapp,[2] whose observations were based on a large number of statistics gathered at home and abroad, from which he concluded: "In all cases as they come, failures, five per cent., moderate results, ten per cent., good results, eighty-five per cent." Ring,[3] compiled statistics

[1]Knapp—Norris and Oliver, *System of Diseases of the Eye*, p. 818.
[2]Knapp—Norris and Oliver, *System of Diseases of the Eye*, p. 818.
[3]Ring—*Medical Record*, Feb. 23, 1895, Vol. vii, p. 234-6.

of 1032 regular operations, gives 90.32 per cent. of successes, and 9.18 per cent. of partial successes and failures after the simple operation; and 88.08 per cent. of successes and 12.92 partial successes and failures after the combined operation.

Smith's[4] latest available statistics of the intracapsular operation show:—iritis, 0.3, or 1 per cent.; loss of vitreous, 6.8 per cent.; first-class results, 99.27 per cent.; second-class results, 0.38 per cent.; failures, 0.34 per cent.

Indian statistics cannot be fairly compared with those just given, because as a rule they are not based on tests of vision, *which are next to impossible to secure,* but are based on the appearance of the eye eight to twelve days after the operation; while it is generally possible to tell a good result from a poor one in this way, it does not compare with visual tests in estimating the success of an operation.

In discussing the subject I shall refer to the principal complications which are met with in the *capsular and intra-capsular methods of operating,* and to certain constitutional conditions of the patients which may favor them, jointly or separately as may seem best. I shall also advise methods of treatment which have been of service to me, with such reference to authorities as are necessary to illustrate some points not covered by my own experience.

No one will dispute the proposition that there is no step which may not complicate cataract operations and that all methods of operating are a compromise with greater or lesser evils (Complications). In other words, no method has a monopoly of all that is desirable, and the converse of this must be true.

Accidents during the operation are few in number and are largely preventable. When they occur, more harm usually results from the complications to which they give rise than from the accidents themselves. Some complications are the results of accidents during the operation; introducing the knife upside down is an example. A few times I have turned the knife and completed the section without difficulty. I think this the proper way out of the trouble. Rupturing the capsule or hyaloid with the delivery hook is another example. Some accidents of extraction are due to complicated conditions, which are either not recognized

[4]Smith's *Arch. of Ophthal.,* Vol. xxxiv, p. 602.

before, are found as the operation progresses, or are encountered during convalescence. Loss of vitreous, because of its being fluid, and the zonula weak, is an example; endogenous infection another; and plus tension another.

To study complications it is desirable to make a distinction between the different stages of cataracts, and to consider the operation which seems best suited to each stage (the incipient, immature, intumescent, mature and hypermature) together with the complications most often observed after such operations. It is also important to note the difference which is real and not apparent only between the complications observed in the intra-capsular and regular operations.

With improved instruments of precision, the sphygmomanometer and the tonometer, we can learn much of value concerning the state of the general blood pressure and the intraocular tension, *two most important points.* I believe the information furnished by these instruments, especially the tonometer, will limit the number of certain accidents and complications in intracapsular delivery especially.

In my experience some of the most frequent complications met with, loss of vitreous, delayed healing of the section, prolapse, incarceration and entanglement of iris and the infrequent loss of an eye from sub-choroidal hemorrhage, if not caused by high intraocular tension and high blood pressure, i. e., above 250 mm., *are usually associated with it.* Again the pressure manipulations on the globe, which are necessary to deliver a cataract in the capsule, or even with capsulotomy when the tonometer reading is normal, cause rupture of a frail zonula and loss of fluid vitreous, when the instrument gives a high reading. Theoretical reasoning and some practical experience has satisfied me that when the blood pressure is above 250 mm. and the tonometer reading above 25 mm., a cataract extraction should be deferred until it has been reduced to 190 mm. or lower, and with it the intraocular tension.

Complications are met with when we have least reason to expect them, through faulty technic, or an accident. On the other hand, the operation may be perfect in all its mechanical details, and yet an eye may be lost through severe complications developing from some *inherent vice in the constitution of the patient,* the operation being an exciting cause only.

The cataract patient should be free from worry or anxiety; confidence in the surgeon being a great aid to tranquility of mind. He should also be as free as possible from bowel, bladder and prostatic diseases, from dyspnea, cough, vomiting, blepharitis, dacryocystitis, styes, chalazia and ectropion. The mental condition should be favorable to self-control, and stimulants should not be withdrawn too suddenly, if the patient is accustomed to their use. An old person should not be kept on the back too many days for fear of hypostatic pneumonia. I have lost three patients from this cause. It comes on very insidiously, often without cough or any symptoms referable to the lungs, so that its presence is not recognized in time to give any treatment.

Exogenous and endogenous infections (because of the comparative rarity of the latter, and the fact that its etiology and pathology are not so well understood as the former) make it desirable that the conditions which are usually grouped under the vague term, autointoxication, and the *rheumatic and gouty diathesis of which we know so little, and incriminate so much,* shall be studied according to modern theories,[5, 6, 7, 8] and the methods of treatment which have given the best results in my hands will be described.

Speculum.

A good all-round speculum, which will not make undue pressure on the globe in a high percentage of eyes, is yet to be devised. The Fisher lid elevator is an excellent substitute for, and should be given the preference over, any speculum, when we fear a patient may act badly.

The Section.

The most common causes of the complications which relate to the section are: Poor light; the use of a dull knife, or one with too narrow and short a blade; not manipulating the knife so that the puncture and the counter-puncture are diametrically opposite; and the section between them not being completed with one thrust of the knife, so that every plane is parallel to every other

[5] Van Noorden—*Disorders of Metabolism and Nutrition.*
[6] de Schweinitz—*Autointoxication in Relation to the Eye, Trans. Ophth. Section, A. M. A.,* 1906, p. 377.
[7] de Schweinitz and Fife—*Autointoxication, Trans. Ophth. Section, A. M. A.,* 1908, p. 20.
[8] Woods—*Autointoxication and Allied Intestinal Troubles, Trans. Ophth. Section, A. M. A.,* 1910, p. 400.

plane. A very shallow chamber is a very unpleasant complication; the iris falling over the knife is another; and an unruly patient is the worst of all.

The degree and axis of post-operative astigmia is determined as a rule by the section.

Senile cataracts in healthy and vigorous patients are sometimes crowded through insufficient sections resulting in considerable traumatism to the parts and, perhaps, loss of vitreous and iris entanglement. In my experience these complications have not vitiated the result in so high a percentage of cases as when the section having been ample the capsule has been ruptured or been opened and a considerable amount of cortical matter has been left behind.

The section for the regular operation should include the upper two-fifths of the cornea, and a conjunctival flap if desired. If any reason makes it desirable the section may be made downward. It should lie exactly in the limbus, the puncture and the counter-puncture should be diametrically opposite each other, the iris should not be touched with the point of the knife, nor the cornea split, nor the capsule of the lens wounded, unless it is purposely done as one of the steps of the operation. (Trousseau.) In this connection read Weeks' paper on the Section.[9]

To avoid complications in the Smith intracapsular operation the section should include one-half of the cornea and be placed above, unless the presence of a macula or a leucoma should require it to be made downward. The best section for Indians is that described by Smith.[10]

But the writer is satisfied from personal experience that a section terminating in a corneal plane nearer the limbus above, with the puncture and the counter-puncture located well back in the angle, will give more room, heal firmer in a given number of days, and be followed by fewer complications and lower degrees of astigmia (and therefore better visual results *among American patients*) than the section described by Smith and McKechnie,[11] although it must be admitted that it is not so well located to receive the emerging lens in its delivery, while its

[9]Weeks—*Trans. Ophthal. Section, A. M. A.*, 1907, p. 35.
[10]Smith—*Ophthalmic Record*, Feb., 1910, p. 54.
[11]McKechnie—*Arch. of Ophthal.*, Vol. xxxviii, p. 227.

peripheral location may possibly favor a slightly higher percentage of vitreous loss.

If the section has not closed and the chamber established in *seven days, or even less, in my experience it is good practice after examining the section for foreign substances with toothed forceps, not to wait for complications but to pass a thin piece of wood saturated with carbolic acid or some other stimulant which has been wiped dry, between the lips of the wound to promote healing.* These remarks apply especially to the large section of the intracapsular operation, although I have seen this complication after the regular operation.

The Iridectomy.

This should be of medium size, but larger for the intracapsular operation. It is very important that the iris be abscised to its extreme periphery, so that no apron is left to be caught in the section, and that the pillars are cleanly cut for the same reason.

In the intracapsular method, especially, I have thought that wide updrawn pupils, from imperfect toilette or loss of vitreous, could be to a large degree prevented and ideal keyhole pupils secured by a small preliminary iridectomy. But after an experience of about one hundred such operations I have found that the inflammatory adhesions, which form around the base of the iris pillars, prevent stretching of the base of the coloboma and make expression of the lens difficult, and loss of vitreous slightly more frequent, than when the iridectomy is made broader at the operation. On the other hand, I have made a preliminary iridectomy, as for glaucoma, in three cases of unripe cataracts in which I intended doing the intracapsular operation, the tonometer having shown plus tension. A broad iridectomy six millimeters at its base under this condition has rendered delivery of the cataracts freer from complications, but it has at the same time lowered the tension and incidentally swelling of the lens and more rapid ripening of the cataracts have caused obliteration of the anterior chamber.

While this explanation of the absence of the chamber is probably correct it has not been easy to differentiate it from the conditions associated with a leaking corneal wound. Therefore, while a preliminary iridectomy may have some advantages *as a*

rule they are overcome by certain disadvantages. The double operation is an objection and some complications other than those I have spoken of can be mentioned.

Capsulotomy.

When the capsule is opened in cases of incipient, immature, mature and, if possible, in hypermature cataracts, I think it is better to do it by extracting the anterior leaf, which renders complete delivery of cortical débris easier, the after-cataract not so thick and tags of capsule less liable to be left behind. These are rather common complications of the regular operation, are responsible for a certain percentage of failures, *and are its weakest points,* too much pressure with a dull cystotome may dislocate a cataract.

Delivery of the Lens.

These complications are intimately connected with the *difference in the diameter of the lens to the diameter of the cornea,* and with the size and position of the section, and especially with the manipulations in delivery of the lens. It is easy to dislocate a cataract and it is a serious complication.

Any of these complications may be a cause of vitreous loss, and I have lost vitreous in attempts to expel and wash out cortical débris in the regular operation.

For cataracts in the immature, incipient, intumescent and also in the hypermature stage, *the best and safest operation in my judgment* is to deliver them in the capsule. Fewer complications will follow, and those which do follow will be milder and more amenable to treatment, and entail fewer losses from severe inflammatory complication.

From the standpoint of complications it is not so easy to decide whether it is better and safer to extract mature cataracts by regular methods or in the capsule.

So much can be said in favor of each method that the personal equation of the operator becomes the pivotal point around which revolves the question of which operation he should perform; other things being equal, experience and skill *count for everything.* I think every man who has attended Smith's clinic will agree that in his dexterous hands, and with docile Indian patients, the method of intracapsular extraction of mature cataracts is not followed by so many or so severe complications as occur

in the regular operations performed by skillful operators of India or America, and I am satisfied that visual results will average much better. I have submitted some statistics tending to establish this point.[12, 13]

Among American patients with mature cataracts, and American operators not skilled in intracapsular delivery, I believe that the regular operation will show fewer complications than the intracapsular. No operator should attempt the intracapsular method unless he has thoroughly mastered the principles and technic of the operation, and the treatment of complications.

Cataracts for the regular operation are selected, extraction is not performed *from choice until they are ripe, for fear of complication.*

On the other hand the Smith operation is adapted to all stages of cataracts, especially the incipient and immature, and the complications which come from the capsule and cortical matter are thus avoided. This does not mean that the intracapsular operation does not have its share of complications, but in my judgment it does mean that if one hundred unselected cataracts are submitted to operation by skilled operators, one-half of them by the capsulotomy method and the other half in the capsule, that the latter will furnish 50 per cent. higher visual results, 20/20 or 6/6 or even 6/3, two months after the operation, i. e., before the secondary operation has been done on the first class of cases, and I think 25 per cent. better permanent vision.

I am aware that only a few confreres share in this estimate of the superiority of the intra-capsular operation; fortunately, *those who do* know most about it, having learned to perform it at first hands in India, and have seen the high-class visual results it can furnish.

Loss of Vitreous.

In either operation this is usually the result of an accident in completing the section, or it occurs with delivery of the lens, but it sometimes occurs afterward in dressing the eye. It may be caused by a weak zonula, by faulty pressure in delivery, from coughing, or sneezing at the time of the operation, or vomiting a few hours afterward. It may be caused by a badly-fitting spec-

[12] Greene—*Trans. Oph. Section, A. M. A.*, 1909, p. 188-9.
[13] Wood—*Trans. Oph. Section, A. M. A.*, 1909, p. 195.

ulum; when this danger is recognized, the Fisher lid-elevator should be employed, or the speculum should be held away from the globe, *and the patient instructed to look straight up.* Again in the intracapsular delivery, by a wrong manipulation of the delivery hook, or by the patient looking down suddenly; more than one-half of my vitreous losses have occurred from this cause.

That the immediate damage to the eye from loss of one-third of the vitreous in the Smith or the regular operation is overestimated, I believe to be a clinical fact. I am not in a position to speak of the possible damage which the same may cause as a late complication, and I know of no statistics which show that it does harm with any regularity. The oft-repeated statement that loss of vitreous is a frequent cause of detachment of the retina, while it cannot be disproved, seems not to be borne out by clinical experience. Pagenstecher,[14] in six hundred intracapsular operations, did not observe a single case. Lister,[15] who examined ninety-eight cases complicated by vitreous loss, from three to seven years after Smith's operation at Jullundur, did not find a retinal detachment. Vail, Clark, Bentley, Timberman, Harding, King and myself, who have visited Smith's clinic, did not observe detachment of the retina in a sufficient number of cases to regard loss of vitreous as an etiological factor. We have no extensive statistics covering this point, or of the late condition of eyes from which one-third of the vitreous has been lost; but I think our accumulated experience is of considerable value on this point.

According to Ring prolapse (loss) of vitreous occurred in 4.27 per cent. of simple operations, and in 7.23 per cent. of the combined operations. His statistics are based on 1032 operations already referred to. Smith's earlier statistics show 6.8 per cent., but he has since made ninety operations without a single loss of vitreous,[16] and he has stated that in selected cases his loss of vitreous would not exceed 2 per cent, in unselected cases 5 per cent.[17] Jamison, in 600 selected cases for the operation, had 5

[14] Pagenstecher—*Extraction des Grauen Staares in Geschlossener Kapsel,* Weisbaden, 1877, and *Archives of Ophthal.,* Jan., 1911.
[15] Lister—*Trans. of the Bombay Medical Congress,* Feb., 1909.
[16] Smith—*Ophthalmic Record,* Feb., 1910.
[17] Smith—Personal Communication and *Ophthalmic Record,* Feb., 1910, p. 58.

per cent., Vail in 358 operations 2 per cent., the writer, in 356 operations, of which he has records, 3.36 per cent.

It must be admitted, however, that outside of Smith's clinic in India, when dealing with a different race of people, and not having his advice and guiding hand to help one, loss of vitreous complicates the operation more than twice as often as in the regular operation; in old cataract patients the vitreous is usually fluid and loss of fluid vitreous seems to be a less serious complication of the healing than if it is normal.[18] The amount is usually small because the position of the patient's eyes does not favor loss; it occurs under such different conditions in the intra-capsular operation, because it is not exposed to the action of the chemically degenerated cortex. Therefore, I believe that loss of vitreous is not so serious a complication as it is in the regular operation. After an experience of about 700 intra-capsular operations I have only seen two eyes lost from excessive loss of vitreous, and in each of these the patient was responsible.

Loss of vitreous in either operation may cause delayed healing of the section, and primary infection and opacity of the vitreous itself rather than detachment of the retina. While it is generally believed that opacities of the vitreous following cataract operation may result from its loss, we must remember that cataract is a disease of advanced life, and operations are performed at the time when *choroidal disease is most common.* Therefore, we should be sure that we are not mistaking a *post hoc* for a *propter hoc;* a condition incident to age and disease of choroid for the result of an accident or a complication of the operation.

Prolapse, Incarceration and Entanglement of Iris.

These occur during or after the simple operation in 5 to 10 per cent. of cases; the percentage is smaller after the combined operation and is not greater in the intracapsular. They sometimes result from undue pressure of the speculum, or from the patient squeezing the eye and losing vitreous, and they are sometimes the result of imperfect replacement of the iris in either operation. (Toilet.)

When these complications follow later, and are not the result of operative accidents, I have most frequently observed them in nervous and restless patients, who do not keep quiet, who finger the dressing or strike the eye and reopen the wound. High intra-

[18]Woods—*Section on Ophth., A. M. A.,* 1907, p. 142

ocular tension and high blood pressure also favor them by delaying healing or reopening the wound. A high degree of astigmia usually follows these conditions.

The question of how and when to operate for prolapse of iris is an important one, made doubly so by the fact that the conjunctival sac is not likely to remain long in as sterile a condition as when the operation of extraction was performed, therefore infection of the eye may follow.

It is generally considered safe to abscise a prolapse within the first thirty-six, or possibly forty-eight, hours. After that time it is not safe to make an abscission, *which to do any good* must open anew the anterior and possibly the posterior chamber and expose the eye to the danger of infection a second time. Later, however, when the bandage has been left off, and the secretion of tears, or possibly medical treatment, have restored the conjunctival sac to its normal condition, we may abscise a prolapse and cauterize its edges with the galvano-cautery, Todd's cautery, or we may use a strabismus hook or a heated probe, if the prolapse is small. The same treatment is indicated for cystoid healing.

Let me emphasize two points which are essential to success: First. If discovered early, draw the prolapsed iris well out of the wound so as to break up the adhesions, and cut it off smoothly, so that it will recede inside of the eye. If not seen until the adhesions are too firm to break up, *a cautery point should be passed through the prolapse to evacuate the aqueous and destroy as much of the iris tissue as is necessary, so that cicitrization shall be complete and cystoid healing and late bacterial invasion shall be avoided.* I know the objections which have been urged against the use of the cautery for this purpose, and that some serious complications have been reported from its use; *notwithstanding these,* in my experience, it has been the best means for curing small prolapses or even large ones, after they have been abscised.

In about 5 per cent. of my cataract operations I have attributed delayed healing, or failure of the anterior chamber to be established, or it may be reopening of the section, to high intra-ocular tension and high blood pressure, probably the results of arterio-sclerosis.

In these cases the above explanations of the delay in healing have seemed consistent with all the facts, and although I cannot

prove or give statistics in support of the statement, I am satisfied that, next to tags of capsule in the wound, which should be drawn out and abscised, or ingrowth of corneal epithelium, which should be cauterized, these conditions of high pressure are the most frequent cause of delay in the healing of cataract wounds and the establishment of a chamber.

In a few cases after examining the section with forceps for a foreign body cauterization with carbolic acid, or stimulating the lips of the wound with silver nitrate, 60 per cent. solution of alcohol, or the use of the galvano-cautery, I have not been able to secure firm healing of the section and the establishment of a chamber until I have made a small *glaucoma iridectomy downward, which has never failed in its purpose.* These remarks refer particularly to cases complicated by a leaking wound and minus tension. It is well known that *a leaking corneal wound seldom becomes infected.* Nevertheless, certain milder complications may be avoided by prompt closure of the section. On the other hand, I have seen a few cases in which the section healed, the anterior chamber did not form but remained shallow and the tension became plus; an iridectomy has always lowered the tension and secured a chamber in these conditions.

Eserin or pilocarpin, or repeated tapping, or drugs to reduce blood pressure, have not succeeded as well in curing the complication. I have not tried sodium citrate in this condition.

I have seen two cases complicated by delayed healing after the intracapsular method, as follows:—After the delivery of the lens, the patient suddenly looked down, the wound gaped, vitreous presented, the hyaloid did *not rupture as it generally does,* but remained bulging in the wound, which healed slowly with a gaping section and poor vision from opacity of the hyaloid, and a high degree of astigmia. It is good practice in such a complication to intentionally lose vitreous so that the lips of the section shall come together and firm healing result.

Irido-dialysis.

I have seen this as a complication a few times, from the patient turning the head and tearing a portion of the iris loose from its periphery. In each method of operating it makes an unpleasant complication.

I have twice caught the loose pillar of iris and drawn it into

the upper part of the section and allowed it to heal there, thus converting a very unsightly condition into a presentable one. But one should not forget the small percentage of complications which may follow such incarceration of iris.

Collapse of the Cornea.

In Smith'e clinic at Jullundur it was the rule after extractions to see collapse or umbilication of the cornea and a downward separation of the anterior from the posterior lip of the section, and recession of the hyaloid and vitreous. I once took a stitch through the cornea and deep episcleral tissue five days after an extraction complicated by this condition, and secured smooth healing. The condition is thought to be more often observed since the introduction of cocain. On Dec. 10th, 1884, I noted it after an extraction in the Eye Ward of the Soldiers' Home Hospital, and after describing the appearance of the eye, dictated the following:—"It may be a question whether the hydrochlorate of cocain did not cause the collapse of the cornea." Santos Fernandez has later described the same condition, as have many others.[19]

The Bandage.

In certain types of faces, with full and prominent eyeballs, the bandage, if too tightly applied, will be uncomfortable to the patient and may complicate the closing of the section by displacing the flaps. Too much pressure usually manifests itself by pain and discomfort, which can be relieved by loosening the bandage. Scales[20] and others contend that "A bandage does more harm than good by making undue pressure on the eyeball and interference with the drainage of the eye." Hess[21] reported that he had treated about one thousand patients with the open method and that the results were at least as good, or better, than with the bandage. These statements refer to the regular operations. I have tried all methods for closing the eyelids, but I still believe a light and carefully applied bandage will admit of fewer accidents and complications than any other dressing, or no dressing at all. In connection with this part of the subject read Jackson.[22]

---

[19]Santos Fernandez—*Archives of Ophth.*, May, 1909.
[20]Scales—*Trans. Section Ophth.*, 1907, p. 109.
[21]Hess—*Trans. Section Ophthal., A. M. A.*, 1907, p. 110.
[22]Jackson—*Effects of Pressure on Healing of Corneal Incision, Ophthalmic Record*, Nov., 1907.

In the opinion of a large number of operators by the regular method it does not complicate the result if the bandage is removed and the eye examined on the second or even on the first day following the operation. I have never been one of the number who insist on meddling with the healing of cataract wounds by frequent inspections; it certainly is not in harmony with modern surgical treatment of other wounds. The argument advanced in favor of early inspection, viz., to be able to treat infection if present, has little weight, because purulent infections are very rare now, 2 to 3 per cent., and I have never seen a purulently infected eye saved by any method of treatment when the vitreous was involved.

Experience has shown that after intracapsular delivery it is of the greatest importance in avoiding complications of the healing, to let the eye alone until four days have passed, unless pain or discomfort indicate that something is wrong. If removal of the dressing shows that all is well, we should not open the eye, but simply change the dressings and bandage it again, and then wait three or four days more. On removal of the dressing about the eighth day it is sometimes noticed that a little redness, or signs of reaction, are present within normal limits; however, these are likely to increase later when we discard the bandage and replace it with dark glasses and the brow shade, they are not painful but seem to be caused by irritation, and are not inflammatory conditions. In complicated cases the redness and reaction are more severe, and will now be considered with complications of the regular operation, under different causes.

Stripped and Latticed Keratitis.

Are frequent complications of the regular, but are perhaps more often observed after the intracapsular operation, unless the cataract has been quickly and smoothly delivered. They are easily recognized and usually pass away in a few days as the wound heals.

Some years ago I had a case in which after a smooth combined extraction the gray lines in Descemet's membrane persisted and lowered vision to 20/200, and the condition became permanent in spite of treatment. They are believed to be caused by disturbance in Descemet membrane from pressure of the delivery hook or spoon, and are thought to be more frequently ob-

served after intracapsular irrigation. The epithelial layer of the cornea will withstand an immense amount of traumatism and clear up perfectly, but the endothelium will not tolerate much interference, *mechanical or chemical*, without becoming cloudy and opaque.

Detachment of the Ciliary Body and Adjacent Choroid.

This is an infrequent complication, I have recognized in one case. The condition was first described by Von Graefe and Leibreich in 1854.[23] According to Wooten[24] it was recognized by Knapp in 1886, and lated described by Fuchs.[25] It has always followed operations with iridectomy, and is probably often overlooked. It is not regarded as a serious complication.

Sub-choroidal Hemorrhage.

Is fortunaely a rare complication. I have seen two cases, the first occurred in India, in an aged Hindoo, the right lens was delivered in the capsule without accident, but on completing the section in the left eye, blood began to ooze from the wound, and a moment later the lens and vitreous were expelled. A pressure bandage helped control further bleeding. This was the only time this complication occurred in about 1200 operations. The other case followed three hours after a normal operation with iridectomy, in an inmate of the Soldiers' Home near this city. These are the only cases I have seen in an experience of about 1500 operations.

Iritis.

Considering synechiæ alone as evidence of a mild attack, and all grades of iris inflammation being included, probably 50 per cent. of all simple and combined operations will show some evidence of its presence. Iritis, cyclitis, and irido-cyclo-choroiditis, which may cause occlusion and seclusion of the coloboma, are a triad of complications whose evil influence on the future integrity of the eye is without limit.

After the intracapsular operation in Smith's clinic, iritis, kerato-iritis, irido-cyclitis and irido-cyclo-choroiditis are rare complications, especially after an operation performed by Smith himself.

---

[23] A. Hill Griffith—Norris and Oliver, *Diseases of the Eye*, p. 359.
[24] Wooten—In Claiborne's *Cataract Symposium*, p. 162
[25] Fuchs' *Text Book of Ophthalmology*, 3rd, American Edition, p. 385.

Methods of treatment may be complicated by an idiosyncrasy for belladonna or scopolamin, sodium salicylate, potassium iodide, etc. Hot applications are grateful in many cases, but ice does more good early if it can be borne. Local blood-letting by the natural or artificial leech is of much value. Internal treatment should be governed by the conditions which have been referred to in the paper and elsewhere under endogenous inflammations. (See reference on the last page of this paper.)

Diabetes.

Diabetes complicates the operation in about 4 per cent. of cases. A diabetic patient should not be operated until the percentage of sugar has been reduced as low as possible, and acid auto-intoxication, if present, should be relieved for fear diabetic coma may complicate the operation. The section in a high percentage of diabetic patients will heal well provided they are operated under favorable conditions, and other complications of the operation are not materially increased.

Albumuria.

"Albumin appears in the urine in quite a high percentage of individuals with cataract. Rothzugel found small quantities of albumin in 26.5 of the 102 patients with cataract which he examined, and larger quantities in 2 per cent."—Weeks.[26]

The possibility of uremic coma complicating convalescence should not be forgotten. Herpes of the cornea sometimes complicates an operation, about the end of the first week; the attacks are usually mild, however. Senile entropion may also require treatment.

After-cataract.

This is the most frequent complication when the capsule is opened and left behind. During the life of cataract patients probably 75 per cent. have an amount of wrinkling and opacification of the capsule sufficient to lower vision to 20/70, and require a discission to restore a higher grade of vision.

Knapp, the great apostle of early discissions, admitted 70 per cent. of discissions in his operations, and Bull and others 50 per cent. It is generally considered much safer to perform discission as soon as possible after the operation, than later, but

[26]Weeks—*Diseases of the Eye*, p. 586-87.

there are many operators who dread a discission more than an extraction. With delivery in the capsule these capsular changes cannot take place; therefore, an after-cataract is not a complication of a normal intracapsular delivery. This fact, together with the harm which can come to an eye from rupture of the capsule, is clearly shown by contrast with eyes in which the capsule has not been ruptured, and *constitute two of the strongest arguments in its favor.* The writer has seen four cases in about seven hundred Smith operations in which the hyaloid became so opaque that a discission was required. In these cases the lens had been delivered in the unopened capsule, but with hemorrhage in the anterior chamber and delayed healing, prolapse of iris, and considerable reaction (iritis), the pupil had been drawn sufficiently upward to require an iridotomy. At the same time the opaque hyaloid was cut through and a satisfactory result obtained. In one case vision equal to 20/70 was raised to 20/15 and in the other to 20/20 from 20/100.

Glaucoma.

I am not familiar with any extensive statistics which show the percentage of cases of plus tension (glaucoma) in the different cataract operations, but if we regard gaping of the wound, reopening of the wound or *failure of the anterior chamber to be established, or remain shallow after the secretion has healed, as evidence of plus tension, I believe it is a more frequent cause of complications connected with the healing than is generally supposed.* Different authorities state that about 2 per cent. of cases of glaucoma are the rule after discissions; but in my experience the percentage has been higher. (In this connection read Standish chapter.[27])

Infections.

These are of two kinds, "purulent and non-purulent, *which differ in degree,* not in kind."[28] Purulent infection is the most serious result of the invasion of the eye by pyogenic germs. Few eyes ever survive such an attack. The few exceptions to this statement are cases in which, because of limited virulence of the infective germs themselves, because the infection is limited to the lips of the section, or because of the natural resistance of the

[27] Standish—*Operations for After-cataract,* Wood's *Ophthalmic Operations,* Vol. ii, p. 1320, *etseq.*

[28] Axenfeld—*Bacteriology of the Eye,* p. 364.

parts, Nature has seemed able to limit or prevent the infection spreading to the whole cornea and vitreous. I have seen a few such complications.

The treatment of purulent infection is very limited in its usefulness. Serum therapy seems to promise something.* †

Non-purulent infections are milder in character and are favored by vices in the constitution of the patient; in this sense they are endogenous. They are among the most obscure conditions we have to treat empirically because of our limited knowledge concerning them.

If the patient is young and his physical condition good, he may be able to throw off or minimize the effects of a non-suppurative infection; on the other hand, if his vital resistance is low, or the infection a severe one, he will not be able to throw it off, and serious damage or total loss of the eye may follow.

The medical treatment of these conditions promises better results than that of some other complications which have been considered. The most hopeful are those associated with choroiditis and opacities of the vitreous, which under powerful, alterative and eliminative treatment often improve beyond our expectations. But a full discussion of endogenous inflammations and their treatment would lengthen this paper beyond reasonable limits, and I have so lately written on these conditions that I do not know of anything new to add. Therefore, I will refer the reader who wishes to follow the subject further to my paper, "*The Medical Treatment of the Patient Before and After the Cataract Operation.*"[29]

Discussion by Cassius D. Wescott.

I wish to endorse all that has been said in regard to the importance of a careful study of the patient and thorough preparation, general and local, before operation. And right here let me express my personal obligation to Dr. Greene for his studies of the cataract patient, especially with reference to hypertension and arterio-sclerosis, and for so generously sharing with us the fruits of his operative experience in India and this country. The general examination should include taking the blood pressure

---

*Weeks *Disease of the Eye*, p. 900 *et seq.*

†Davis Pyles' *System of Ophthalmic Practice*, p. 51 *et seq.*

[29]*Trans. Ophthal. Section, A. M. A.*, 1911, and *Journal American Medical Association*, Dec. 3, 1911.

and a study of the cardio-vascular system. It is very desirable, when possible, to know the condition of the retinal vessels from previous examination or somebody else's notes. I have refused to operate when the sphygmomanometer registered 200 mm. until all means had been exhausted for lowering the pressure. It is surprising what can be done with rest, diet, and drugs, and even if the reduction is only temporary, it serves our ends and may prevent delayed healing or disastrous hemorrhage.

I will not be hurried in my care of these patients. We should have them under observation long enough for adequate study and preparation—regulation of diet, cleansing of the bowels, skin, etc., and putting them in the best possible condition. I am in favor of scrubbing the face with hot water and soap and flushing the eye with warm boric acid solution two or three times a day for many days, and dressing the eye over night with White's ointment the night before operating. If this is done faithfully it is not necessary to irritate the eye, chemically or mechanically, just before the operation. I have a culture made when the patient enters the hospital and am guided by the results as to other treatment of the conjunctival sac.

I do very few cataract operations, and will probably never do a simple extraction, or an extraction in the capsule, intentionally. I am quite willing to grant, however, that in the hands of those who have been trained by Col. Smith, the intracapsular operation should give a larger percentage of brilliant results in cases of immature, swollen, and hypermature cataract than the regular operation. I always do a preliminary iridectomy, if my patient will consent, and feel confident that it increases the percentage of good results in my hands. The possibility of infection is negligible and the danger of iritis following the subsequent extraction is very much lessened, I am sure. The patient, having had the experience of the minor operation, loses his fear, has better self-control during the extraction, and the safe delivery of the lens is facilitated. The preliminary iridectomy gives us a valuable opportunity to study the mental state and behavior of the patient before the more serious operation is attempted. After seeing Prof. Fuchs pull capsule, lens, and some vitreous out of an eye with his capsule forceps, I decided to stick to my cystotome and do more discissions if necessary. I have not had an infection after a needling and only one glaucoma, and this in a

very bad subject with advanced arterio-sclerosis where simple extraction had been done by a confrere.

I believe cortical matter is chemically and mechanically irritating, and that the less we leave behind the better. The method of removal must depend upon the case and the operator. I would not irrigate if I could remove most of it by gently stroking the cornea and freeing the lips of the wound with the spatula. A large incision is the best safeguard against retained cortical substance, and it has been my practice to introduce the knife only a little above the horizontal meridian in all cases except when a small, hard lens was obviously present. I believe that White's ointment is of value in the dressing of all wounds of the eye and use it habitually.

I do not use a bandage except after enucleation and in children, but employ a light dressing secured by adhesive strips and protected by a Ring mask. I have always dressed these cases daily except when vitreous has been lost. In such cases, and in very nervous patients, it may be better to delay the first dressing, but I have seen no complications which I could refer to the daily dressing; and many of my patients, who are all private cases and mostly intelligent Americans, have spoken of the comfort following the cleansing of the lids and renewal of the dressing. We may encounter fluid vitireous and weak zonula where we least expect it, and must "take our medicine." In my experience cyclitis is apt to follow, with more or less permanent opacities, even when the eye becomes and remains quiet.

I am indebted to Dr. Greene for the suggestion to do iridectomy downward in case of failure of the wound to close. I have not torn an iris since I adopted the plan of fixing the eye and drawing out the iris myself, and having a trained assistant use the scissors.

I fully agree with all that Dr. Greene has said in regard to purulent infection, and have advised the removal of the eye when the vitreous has become infected, and before panophthalmitis has added to the danger.

CHAPTER VIII.

GENERAL DISCUSSION

(*Oliver Tydings*) It is important to bear in mind that the physical state of the patient has much to do in determining the success or failure of any operation. Dr. Dodd's citation of an instance of closure of the pupillary area after intracapsular extraction shows what Nature will do in an endeavor to protect the organism against infection. In the statistics at our command there is suggested the question whether or not a Smith operation has any advantages over the ordinary capsulotomy with forceps. As between a capsulotomy with a cystotome and the "intracapsular extraction" (after the method of Smith), if post-operative results alone are to be considered, statistics are fairly replete and the results so overwhelmingly in favor of the Smith operation that there is no good reason why the use of the cystotome should not be abandoned. As between the method of Smith and the removal of the anterior capsule by the use of forceps the latter is to be preferred. Especially is this true if one uses the capsule forceps devised by Fisher, which permits the eye to be held in the primary position while we remove the anterior surface of the capsule, the part from which come the elements that enter into the formation of the after-cataract. Only by comparative statistics between these two methods made on an equal number of operations is it possible to draw definite and valuable conclusions. Anyone could perform the Smith operation if he would read carefully the description given by Dr. Vail in his monograph on the subject.

(*W. F. Coleman*) I favor preliminary iridectomy, the operation which I have performed during the past fifteen years. Mr. Prichard and Mr. Wells said that they would not do any other operation if the patient would submit to the preliminary iridectomy. Others who speak with authority have expressed themselves similarly. As to the visual results, it has been shown by

such men as Devereaux Marshall, of the London Hospital, that the two operations compare favorably. As for the keratome, I have not used it for twenty-five years because I once produced with it a traumatic cataract in a clear lens. It is more difficult to use the keratome and it is more likely to puncture the lens than the von Graefe knife, which I prefer. One advantage of the preliminary iridectomy is the maturing of the lens in fully 50 per cent. of the cases. There is also no hemorrhage during the extraction. The patient is trained for the second operation. The degree of trauma is divided between two operations.

(*Geo. F. Suker*) An iridectomy should be done in every cataract extraction. As to doing the extraction in capsule or not, that is largely a matter of technique and selection of cases. One can safely start to do the intracapsular extraction and if he meets with any resistance, obstacles, or complications he can still safely revert to the capsulotomy method. This procedure does not endanger the safety of the eye nor the ultimate end result of vision.

The intracapsular extraction is definitely indicated in certain cases, e. g., when the cataract is hypermature, when there is a large amount of soft substance present, when the lens has undergone cystic degeneration—one that is more than hypermature. In these cases when the capsule is opened freely the degenerated lens substance is disseminated throughout the anterior chamber, gets behind the iris, lodges in the angle of filtration, has a tendency to block the pectinate ligament, and is also absorbed. This degenerated substance is toxic and, therefore, is prone to set up either a localized or a more or less general iritis, irido-cyclitis or an anterior choroiditis, in fact what might be called a general uveitis. This degenerated lens substance is well comparable to the contents of any cyst as the result of degenerative processes. And we know that when the contents of such a cyst gains access to any cavity it is very liable to set up trouble—this we recognize from general surgical principles. Hence we can see that the intracapsular operation is almost one of necessity in such cases if we wish to avoid a large percentage of dire results.

When the vision is reduced far below the point of economics, and transillumination shows the lens uniformly opaque, one can, with safety and confidence, do a capsulotomy operation and achieve as good a result as with the intracapsular method. This from

any standpoint that you may desire to view either operation. It is far better for the American surgeon, at least for those who have not had the opportunity of being with Smith, or some of his competent pupils as Vail or Greene, to adhere to the old capsulotomy method. Remove as large a piece of the capsule with one of the various capsule forceps, thus avoid the remaining shreds of capsule from curving upon themselves and incorporating, not only tags of the posterior surface of the iris, but also lens remains, which condition is often entailed with more or less complications. Then, too, a relatively large iridectomy will easier enable the lens to escape and reduce the chances of the soft substance slipping up behind the pillars and remaining in the angle of filtration.

I am glad that mention has been made of the importance of the ophthalmologic surgeon being an internist. The physical condition of the patient is of paramount importance. The mere fact that a patient has a cataract is evidence that there is some physical condition, local or general, which is responsible for it. For a cataract is only a local expression of a general condition, or secondary to ocular disturbances, such as a low grade of anterior choroiditis, cyclo-choroiditis and the like. Therefore by studying carefully the proper etiologic factor and the physical condition of the patient and instituting the proper treatment therefor, many accidents and complications may be avoided.

It is on the above points and facts that one should decide whether or not the capsular or the intracapsular operation should be performed.

(*H. H. Brown*) I feel that no part of the cataract operation deserves greater consideration than capsulotomy. Upon its successful performance depends largely not only the immediate favorable results of our operation, but has so much to do with the ultimate vision obtained. There is one point upon which we all agree, namely, that the prime object of opening the capsule is to allow the escape of the lens. The more nearly the capsule is emptied of its entire contents, the more complete has our object been attained. Therefore, whatever means we may resort to in our efforts to this end, it must be acknowledged that the larger rent made in the capsule the easier and more completely can we expel its contents. I have had no experience in opening the

capsule several hours previous to extraction of the lens, neither have I ever done so with the knife during my corneal incision. In all my capsulotomies I have relied chiefly upon the cystotome. I use capsule forceps and am certain that with increased experience in its use I shall come to recognize its superiority, especially in hypermature lens and where I expect a tough capsule. I never attempt the use of a capsule forceps save in the case of preliminary iridectomy which, by the way, I always prefer. I believe Fisher's capsule forceps possess special advantage, as clearly shown by him, when it is desired that the ball should be directed upward. In the use of the cystotome our purpose is often aborted by its careless manipulation. The cutting surface must be sharp so that a clean cut is made, not a laceration or tear.

The incision is made clear across the surface of the lens and as near the periphery as possible (from top to bottom), and this incision should be met by a horizontal incision as near the equator of the lens as possible. The capsular contraction from such incision will allow escape of the cortical matter and tend, in a measure, to obviate the necessity of secondary operation or operations, which after all is the disadvantage of the removal of the lens from its capsule. Not that I advocate that any form of capsulotomy will entirely obviate the necessity of secondary operations, with their more or less detrimental results to the integrity of the eye, but I am certain that greater care in the use of the cystotome, a little more time and patience in coaxing out cortical substance, will lower the per cent. of secondary operations, lessen risk to the eye and enhance the visual acuity.

The subject under discussion before this meeting to-night, viewed from every standpoint, is of the greatest importance. It pertains to a successful issue in the most delicate operation in the domain of surgery. Many points have been brought out of personal interest to each of us because they are the result of years of careful experience. In a hurried review of this symposium it is impossible to attempt to discuss each paper. In my mind, however, too great stress cannot be placed upon the importance of properly preparing the patient for operation. I heartily agree with all the essayist said upon the subject. I believe that diligent search should be made for every departure from the normal throughout the entire system. I further believe that the personal equation of the operator to the patient is important. As to the

extraction of the lens, I feel that it is my personal loss in not having sufficient experience in the Smith or Indian method. Most of us have had years of experience in removing the lens from its capsule. Accordingly we can discuss this method freely and intelligently. I presume, however, not five per cent. of this audience has ever performed the Smith operation in strict accordance with Smith's method, and therefore a general discussion of this portion of the symposium must be very largely theoretic. We may say, and with truth, that the Smith extraction seems hazardous to the integrity of the eye. With equal truth we must admit that, if successfully accomplished, two great obstacles in cataract operations have been overcome—the removal of immature cataracts and the capsule in mature ones. With the enormous experience of Major Smith, a thoughtful review of his reports, augmented by the experience of Drs. Green and Vail—both of whom we have had the privilege of seeing operate—it would seem but just that judgment be reserved until such time as our personal experiences warrant a more general discussion.

(*H. B. Young, Burlington, Iowa*) Comparisons, as we all know, rarely escape being invidious; but if we remember that in the field of art, to which this work belongs, there are many masters with diverse methods, and that tastes differ, we may compare less invidiously. In some respects cataract operators are like portrait painters. There are those who stand out above the common herd; but the technique is individual and the effects, while largely dependent on its perfection, are not invariable.

The psychic state of both artist and subject may also contribute something to the result. To my mind this psychic state is of more importance than so far indicated. In my limited experience of between 200 and 300 operations I am satisfied that I have attained the "eighty-five per cent." largely through attention to this detail. We all agree that the purely physical functions should be in their highest state of efficiency; so why should not the mental? Old people rarely sleep well in strange beds, and they are thus peculiarly liable to depression from happenings that would otherwise be ignored.

I have many times postponed the operation because the one or the other of us was not "in the vein." A low barometer with impending storm, or excessive temperature for the season, I consider prohibitive. One who has waited months for the cataract

to "ripen" can easily wait a few days for every possible condition to be favorable.

Then the question of what the patient wants is to be considered, the finest, or just practical, vision. It should be stated that extraction in the capsule involves more immediate risk but offers a greater eventual prize. Beyond this the discussion should deal with the personal talents of the operator: ambidexterity, the choice of certain knives, forceps and scissors, because of size and suppleness of the hands, or the reverse, plus the acuteness of the tactile sense. We differ so much in these respects.

For instance, I never make the combined operation unless compelled to by untoward events in the performance. The cosmetic effect is no more a factor in this than it should be; the real reason being that in spite of a tactile sense, pronounced by one of my teachers "above the average," I have never been able to acquire a satisfactory technique for the management of the cut iris. Again I remove retained cortex more easily by lavage, which is routine practice, than by manipulation. I have tried several irrigators, but Reik's suits me best.

All in all the subject seems to me to be a question of adaptabilities more than principles. The operator with only the average tactile sense will pronounce the Smith operation unsatisfactory; and the operator with large fingers will be handicapped like the gynecologist with short fingers.

[There are many steps in the extraction of senile cataract upon which there is general agreement among operators. There can be no question about the advisability of thorough preparation. "Well begun is half done" is true here if anywhere. The need is not so much the teaching of such thorough preparation but the consistent following out in practice. "A smooth incision promotes a smooth healing," might well become a surgical adage. The fewer the number of movements of the knife the better, if this result is to be obtained. The less cortical material left in the eye the better. This means either maturity of the lens or the Smith operation. The less anterior capsule left in the eye the less the need of a secondary operation. This again means the Smith operation or the removal of anterior capsule. The loss of vitreous is an accident which we all try to avoid and all agree that it menaces the integrity of the eye in proportion to the quantity lost. The danger of such loss must be greater in the intra-cap-

sular operation. If we are to be converts to the new method, we must know more about the vitreous than we do. Dr. Claiborne in his book previously referred to suggests that the future treatment of cataract will be along the line of prophylaxis. This is true in a measure of all surgery, but until that time approaches the operator should fit himself to use the particular method or technic which will be to the best interest of the patient.—Ed.]

INDEX.

THE PREPARATION FOR OPERATION 17
Urinalysis 17
The nervous system 22
Local preparations 23
The preparation of instruments 25
Discussion 25
THE INCISION 29
Advantages and disadvantages of conjunctival flap 30
Development of modern incision 31
Technic of incision 33
The linear incision 37
Discussion 37
IRIDECTOMY AS A PART OF CATARACT EXTRACTION 41
Preliminary iridectomy 41
Cataract extraction with iridectomy in one sitting 44
The technique of iridectomy in the combined operation .. 46
Modification of the ordinary iridectomy in cataract extraction 48
Iridectomy in the removal of cataract in its capsule 50
Complications of iridectomy 51
Discussion 52
THE CAPSULOTOMY 57
Object of capsulotomy 58
Should capsulotomy be performed? 58
Capsulotomy methods 58
The light 63
Position of surgeon and assistant 63
Method of using capsule forceps 64
Discussion 65
THE DELIVERY OF THE LENS 69
Delivering the lens after Fisher capsulotomy 69
Difficulties that may arise in delivering lens 76
Common method of lens delivery after capsulotomy 79
Delivery of the lens by the Smith method 81
Troublesome cases 84
The intra-capsular delivery 85
Version delivery 89
Combined delivery 90
Discussion 94
Tabulation of replies to series of questions (Tivnen) ... 110

THE TOILET 137
The removal of cortex 138
The reposition of the iris 140
The cleansing of the incision 141
The coaptation of the lips of the incision 141
The cleansing and irrigation of the conjunctival sac 142
Discussion 142
COMPLICATIONS AND AFTER-TREATMENT 145
Speculum 148
The section 148
The iridectomy 150
Capsulotomy 151
Delivery of the lens 151
Loss of vitreous 152
Prolapse, incarceration and enlargement of iris 154
Irido-dialysis 156
Collapse of the cornea 157
The bandage 157
Stripped and latticed keratitis 158
Detachment of the ciliary body and adjacent choroid 159
Sub-choroidal hemorrhage 159
Iritis 159
Diabetes 160
Albuminuria 160
After-cataract 160
Glaucoma 161
Infections 161
Discussion 162
GENERAL DISCUSSION 165

28.N.81.
A symposium on the extraction o1912
Countway Library BEY1223
3 2044 046 123 774

28.N.81.
A symposium on the extraction o1912
Countway Library BEY1223
3 2044 046 123 774